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ACCOUNTS AND PAPERS:

SIXTY-THREE VOLUMES.

— (24.) —

MISCELLANEOUS—*continued.*

Session

31 *January* 1893——5 *March* 1894.

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1893-94.

ACCOUNTS AND PAPERS:

1893-94.

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REPORT

TO

HER MAJESTY'S PRINCIPAL SECRETARY OF STATE FOR THE HOME DEPARTMENT

ON THE

CONDITIONS UNDER WHICH THE QUARRYING OF STONE, LIMESTONE, SLATE, AND CLAY IS CONDUCTED, WITH THE OBJECT OF DIMINISHING ANY PROVED DANGERS TO THE LIFE OR HEALTH OF THE WORKPEOPLE ENGAGED THEREIN;

BY THE

QUARRY COMMITTEE OF INQUIRY.

Presented to both Houses of Parliament by Command of Her Majesty.
December 1893.

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OPEN QUARRIES.

Report of the Committee appointed to inquire into the Dangers to Life, Limb, and Health, attending Employment in Open Quarries.

To the Right Honourable HERBERT HENRY ASQUITH, Q.C., M.P., Her Majesty's Principal Secretary of State for the Home Department.

SIR, Home Office, November, 1893.

IN compliance with your instructions we have conducted an inquiry into the conditions of labour at open quarries, with a view to diminishing any proved dangers to the life, limb, or health of the persons employed. In accordance with your desire, Dr. Le Neve Foster, with the assistance of two other gentlemen, will make an inquiry into the condition of the Merionethshire Slate Mines, and will report to you in due course.

I.—FIELD OF INQUIRY.

The field of the inquiry is very wide and varied, for it includes workings scattered about in almost every county of the kingdom, sometimes shallow pits employing only a few persons, at other times large excavations of great depth employing several hundreds. The following table is an abstract of the Census Returns of 1881 and 1891, which are given in detail in Appendix I., and shows the number of persons engaged in quarrying stone, limestone, and slate, in working clay, and in making bricks, plaster, and cement.

PERSONS EMPLOYED.

Division of the Kingdom.	1881.					1891.				
	Stone Quarries, including Limestone.	Slate Quarries.	Clay-workers, including Brick-makers.	Plaster and Cement Manufacturers.	Total.	Stone Quarries, including Limestone.	Slate Quarries.	Clay-workers, including Brick-makers.	Plaster and Cement Manufacturers.	Total.
England -	25,801	1,184	53,074	3,641	83,700	33,093	1,256	47,392	5,618	87,359
Wales - -	3,069	13,716	1,845	39	18,669	3,720	12,507	2,192	18	18,437
Scotland -	7,308	762	3,328	58	11,456	9,327	799	4,126	82	14,334
Ireland - -	1,210	98	501	24	1,833	725	92	646	44	1,507
Total -	37,388	15,760	58,748	3,762	115,658	46,865	14,654	54,356	5,762	121,637

In considering the above figures it is necessary to recollect that they include many persons employed in or about underground workings, which are legally mines, though usually spoken of as quarries. Such, for instance, are certain workings for building-stone in Somersetshire, flagstone in Lancashire and Yorkshire, and slate in Merionethshire. Consequently the totals in the table are higher than they would be if the Census Returns referred solely to excavations open to daylight. On the other hand it is quite possible that certain workers in quarries escaped mention under the proper head, owing to their having called themselves simply "labourers," without specifying the precise nature of their employment.

II.—PLACES VISITED.

In conducting our inquiries we have visited many important quarries worked for building-stone, road-stone, slate, limestone, clay, gypsum, or ironstone in the following counties:—

ENGLAND.

Cheshire.	Leicestershire.
Cornwall.	Nottinghamshire.
Derbyshire.	Shropshire.
Devonshire.	Surrey.
Dorsetshire.	Sussex.
Durham.	Wiltshire.
Kent.	

WALES.

Anglesey.	Glamorganshire.
Carnarvonshire.	Merionethshire.
Denbighshire.	Montgomeryshire.
Flintshire.	

SCOTLAND.

Aberdeenshire.	Fifeshire.
Argyllshire.	Renfrewshire.
Edinburgh.	

We have thus a general idea of the conditions under which quarrying is being carried on at the present time.

We here take the opportunity of acknowledging the great readiness displayed by the owners and managers of quarries in showing us their workings, and in affording us much valuable information.

III.—STATISTICS OF ACCIDENTS.

We have found the area of the inquiry so much larger than we anticipated, and the time at our disposal so limited, that we have not been able to lay before you recent statistics, showing the mortality from accidents among different classes of quarrymen, as we desired to do. The returns submitted in Appendix II., some of which are as complete as could be wished, show that great disparity exists in the death rates, some being much lower than those of mines, and some much higher. Many of the accidents are attributable to neglect or recklessness on the part of the workmen themselves. In order to obtain more accurate statistics in future, we recommend that the verdicts of coroners' juries and the returns of registrars should more fully describe both the nature of the occupations of the deceased persons, and the precise causes of their deaths. In this we are confirmed by the evidence of Dr. Ogle.

IV.—EVIDENCE TAKEN.

In addition to making personal investigations at quarries, we have taken formal evidence from owners, managers, doctors, and working quarrymen, and, as will be seen by referring to Appendix III., many important facts and suggestions were brought under our notice.

Dr. William Ogle, lately Superintendent of Statistics at the General Register Office, kindly gave us at some length, the result of his investigations into the mortality of quarrymen, both from accident and disease. His conclusions are somewhat surprising. In the first place he told us that the death rate of slate and stone quarrymen, though higher than that of the average male person, is precisely the same as that of the medical man, and is lower than that of cabmen, bargemen, carters, law clerks, butchers, hair dressers, book-binders, plumbers, glassmakers, and others. Secondly he informed us that the mortality from accidents among quarrymen

approximates to that of coal miners, and is almost the same as that of fishermen and further, that the quarryman's life is shortened in a remarkable degree by phthisis and other diseases of the respiratory organ.

The excessive death rate from these complaints is attributed by Dr. Ogle mainly to the inhalation of dust. Whatever be the cause, we are led to the conclusion that it is a most important duty to protect the quarryman against any influences which would tend to promote these diseases.

Considering the importance of the subject and the fact that Scotland and Ireland were not included in Dr. Ogle's figures, we think it highly desirable that further investigations should be made, based upon the death registers of recent years. If such an inquiry is agreed to, it will be desirable, for the particular object in hand, to compare the death rates of different counties, or convenient districts where a considerable number of persons are employed in quarrying; and the value of the statistics will be increased if all persons are included, so as to institute a comparison between quarrying and other occupations, males and females, and persons living in quarry districts and the population of the United Kingdom generally.

V.—SPECIAL RULES.

After considering the evidence tendered to us, the notes of our visits to quarries, and the results of our previous experience, we have drawn up a code of special rules designed to prevent accidents and to mitigate their effects. In framing these rules we have made use, to some extent, of those proposed by Mr. Richmond, and of others already in force at certain quarries. The code has been devised so as to be applicable to all quarries, and is capable of being supplemented by further regulations suitable to any individual case.

We desire, specially, to point out that under the existing state of the law these rules cannot be enforced at quarries which, owing to the absence of machinery and to the fact that no women, young persons, or children, are employed, are neither "factories" nor "workshops." Various matters relating to the health and safety of the workpeople are not mentioned in the code of rules because they are already provided for by the Factory and Workshop Acts, such as prevention of dust, ventilation, provision of proper sanitary arrangements, and fencing of dangerous machinery.

SPECIAL RULES.

The following rules shall be observed, so far as is reasonably practicable, at all open quarries, that is to say, at any place not being a mine, in which persons work in getting clay, stone, coprolites, or other minerals.

1. Safety of Quarries.

a. The working of the sides, tops, or overburden of quarries shall be carried on so as to prevent dangerous falls.

b. The overburden or "tops" of quarries, and all loose ground or material shall be cleared far enough back from the edge of the quarries to prevent danger to the persons employed.

c. Where a quarry is worked in steps or "galleries," these shall be of sufficient breadth in comparison with their height to ensure safety as far as possible. When a quarry is worked in pits, sufficient support to the sides shall be left to ensure safety to those employed.

d. There shall be, as far as practicable, a clear space between the outside rails of tramways and the edges of galleries, sufficient to prevent both the falling of stones from the waggons and the falling of the men themselves to galleries below. Where such a space is impracticable the edges shall be securely fenced.

e. The top of every quarry, if dangerous, and the top of every shaft, shall be securely fenced.

f. All bridges shall, if dangerous, be securely fenced.

g. In addition to the accidents which have already to be reported under the Factory and Workshop Acts, 1878 and 1891, all accidents causing serious personal injury to any person employed in or about the quarry from any cause whatever shall be reported

to the inspector and to the certifying surgeon of the district by the occupier or agent within 48 hours of their occurrence.

h. If work is carried on at night, it shall be under special supervision, and sufficient light shall be provided.

2. Blasting.

a. All explosives shall be conveyed from the magazine to the quarry, and kept till used in secure packages so made and closed as to prevent any escape of the explosives and any danger from sparks. Every workman or gang of workmen possessing explosives unused, shall keep them in his or their own locked box provided for that purpose exclusively. The interior of the box shall be kept clean and free from grit. Detonators shall be kept in separate and suitable boxes. No person shall smoke while carrying, handling, or using explosives, or when in proximity of any person so doing.

b. No iron or steel rammer, pricker or charger, or scraper, shall be used for charging a hole with any explosive. Wooden rammers only shall be used for pushing in or ramming down explosives. No straw fuses shall be used. After firing a charge of any explosive, no further charge shall be introduced into the hole or into any rent made until after the lapse of twenty minutes.

c. Due warning shall be given by an efficient system of signals before blasting may be commenced, and when it is finished. In quarries where blasting occurs daily, it shall as far as possible take place only at fixed stated intervals. Where danger from blasting may arise to the public, efficient means shall be taken to give them due warning.

d. A sufficient number of proper shelters shall be provided (which must be used by the persons employed) except where all leave the quarry during blasting.

e. If a shot has apparently missed fire, no person shall be allowed to go near it until after the lapse of half an hour. The person or persons whose shot has apparently missed fire, shall immediately give warning of the same. A shot that has missed fire shall not be unrammed, bored, or picked out.

f. Each quarry shall frame further regulations as to intervals and signals for blasting, copies of which shall be kept constantly affixed in the quarry office, and in a sufficient number of places in and adjacent to the quarry.

g. Copies of such other regulations concerning explosives and blasting as may be framed shall be posted up in the quarry office and the quarry.

3. Access to Quarries.

a. Secure means of access shall be provided by which workmen can go to and from their working places.

b. A ladder permanently used for the ascent and descent of persons in the quarry shall not be fixed in a vertical or overhanging position, and shall be inclined at the most convenient angle, and every such ladder shall have substantial platforms at intervals of not more than 10 yards.

c. All tunnels used as a regular means of access to working places shall be kept sufficiently lighted and drained, and where the space between the side of the waggon and the side of the tunnel is less than three feet, places of refuge shall be provided at intervals not exceeding 100 yards.

d. Persons shall not be raised or lowered in cages, tubs, buckets, or waggons unprovided with guides, except in sinking shafts.

e. Where machinery is used for raising or lowering persons, further regulations shall be made to suit the special circumstances of the case.

4. Machinery and Plant.

a. Each steam boiler, whether separate or one of a range, shall have attached to it a proper safety valve and also a proper steam gauge and water gauge, to show respectively the pressure of steam and the height of water in each boiler.

b. Every steam boiler shall be cleaned out and examined internally at least once in every twelve months, and a record of its condition shall be kept at the office of the quarry.

c. No person shall remain under the rope or chain of an aerial incline whilst a waggon or load is ascending. Whilst a load is being moved on the landing table no person shall remain immediately underneath it; and no person shall be allowed, without special permission from the manager or other official, to ascend or descend by means of an aerial incline.

d. The person or persons in charge of plant, machinery, or appliances shall daily inspect the same, and forthwith report any defects with a view to their being remedied. Once a month at least all plant, machinery, or appliances shall be thoroughly examined, and a record of their condition shall be kept at the office of the quarry.

e. The rails on the tops of all inclines and on all landing tables shall be provided with proper stops.

f. Every crane shall be provided with an efficient catch.

g. The permanent ways shall be kept in an efficient state of repair.

5. Duties of Officials and Workmen.

a. It is the duty of all officials to see the provisions of the Acts and these special rules carried out.

b. An official or officials shall daily inspect every working place and travelling road and all adjacent places from which danger might arise, and should danger appear steps shall at once be taken to remove it. They shall satisfy themselves as to the safety of any rope and other appliances used by the workmen.

c. The proper official or officials shall record and report all dangers notified to them by the workmen.

d. It is the duty of all workmen to comply, so far as is reasonably practicable, with the provisions of the Acts and these special rules, and with such directions concerning safety and discipline as may be given to them by the officials.

e. Each workman working on the face of a rock, or standing on a narrow ledge, shall, when requisite, use a rope or other appliance, and every workman shall, before commencing work, satisfy himself as to the safety of any rope and other appliances in his personal use, and shall not use anything that he finds unsafe.

f. Each workman shall, before commencing work, and during the course of it, and especially after blasting, make a careful examination of his working place, and remove any loose rock, stones, or ground which might be dangerous.

g. No workman shall throw down rock, stones, ground, or other material, which might endanger other persons, without giving them warning and seeing that they have retired to a safe place.

h. Every workman who notices anything that appears unsafe, or likely to produce danger, shall forthwith report it to an official.

6. Ambulance.

At quarries where more than 25 persons are employed, ambulances or stretchers with splints or bandages shall be provided at convenient places ready for immediate use in case of accident.

VI.—FENCING OF QUARRIES AND SANITARY ARRANGEMENTS.

From our personal knowledge we are able to say that the Quarry (Fencing) Act, 1887 (50 & 51 Vict. cap. 19), is not duly enforced in many districts. Evidence has been given, and in some instances confirmed by our inspections, that sanitary arrangements are occasionally insufficient, or wanting, or likely to cause the pollution of streams. Powers already existing under present laws seem to be sufficient to deal with both these matters. We would suggest that the attention of the Local Government Board should be called to them.

VII.—RECOMMENDATIONS.

There are several matters which we should like to recommend to the consideration of quarry owners, in the hope that they will receive attention. We have no hesitation in making these recommendations, as we are simply pointing out arrangements which we have noticed at several well managed quarries.

They are as follows:—

(1.) Houses for Meals and drying Clothes.

It is very desirable that the workmen should have their meals in comfort. In some cases they live close to the quarries and can go to their own homes, but often this is not possible. Where men have to walk long distances to their work and are exposed to much bad weather, it appears desirable that they should have means of drying their clothes. We therefore recommend that houses should be provided for taking meals and drying clothes.

(2.) Barracks.

Where men live in barracks belonging to the owner of a quarry care should be taken to enforce great cleanliness. Meals should not be taken in the sleeping apartments, and the practice of allowing two men to sleep in one bed should be prohibited.

(3.) Food.

Much evidence has been given to us about the food of quarrymen. We are of opinion that the Welsh quarryman might with advantage copy his brethren in Scotland and elsewhere, and make use of a more varied diet such as porridge and milk, broth with vegetables, &c., and be careful to avoid stewed tea, for we were struck by the fact that the physique of the Scotch and Cornish quarrymen was decidedly superior to that of the Welshmen.

The establishment of the classes for teaching plain cookery in quarry districts could not fail to prove advantageous to the workmen.

(4.) Instructions in Ambulance Work and Nursing; Hospitals, &c.

We have remarked with pleasure that some hospitals already exist, and that ambulance classes have been established in connexion with many quarries. We consider that further hospital accommodation is not only desirable but also much needed. We further recommend that instruction in ambulance work should be universal, and that while the husbands and sons are learning how to render first aid to the injured, the wives and daughters should be taught nursing. Like cookery, this instruction might be provided under the Technical Education Act. When persons are exposed to special injury from any cause, special appliances should be used to protect them, such as spectacles, respirators, &c.

(5.) Recreation.

It was satisfactory to learn at some quarries that the wants of the men and boys after working hours were not forgotten, and we are of opinion that the general well being of the workpeople can undoubtedly be promoted by facilitating their means of recreation.

(6.) Qualification of Managers.

It is very difficult to lay down any hard and fast line for workings which vary so much in size and risk as quarries, but we advise that a person before becoming manager should have had practical experience in a quarry for at least two years.

FURTHER LEGISLATION.

Seeing that many quarries will escape the action of the proposed special rules for the reason given in Section V., we consider further legislation necessary in order to bring them under the law.

We are, Sir,
Your obedient Servants,

(Signed) Frank N. Wardell (Chairman).
W. W. Vivian.
J. J. Evans.
W. J. Williams.
W. A. Darbishire.
C. Le Neve Foster.
H. S. Richmond (Secretary).

By Mr. Wardell, Mr. W. W. Vivian, Dr. Le Neve Foster, Mr. W. A. Darbishire, Mr. J. J. Evans, and Mr. W. J. Williams.

If the present laws are to be altered or amended, it appears to us desirable that most of the quarries should be placed under the inspectors of mines, for the reason that in many cases the quarry is adjacent to a mine or almost forms part of it.

Quarrying involves the application of processes often identical with those in use at mines. The transfer of all quarries to the inspectors of mines would throw upon them the duty of visiting every brickfield in the kingdom. This difficulty might be solved by leaving clay pits and their works with the inspectors of factories as at present, and limiting the jurisdiction of the inspectors of mines to quarries worked for stone and slate. If any such transfer is made, care should be taken to give the inspectors of mines the powers of the inspectors of factories, so as to avoid the waste of time and money caused by dual inspection.

(Signed) F. N. Wardell (Chairman).
W. W. Vivian.
J. J. Evans.
W. J. Williams.
W. A. Darbishire.
C. Le Neve Foster.

By Mr. Richmond.

If further legislation is decided upon, the three following courses would appear to be open.

(1.) The obtaining of the mineral, whether above or below ground, to be placed under the inspectors of mines exclusively. The subsequent manufacturing processes, at quarries and metalliferous mines, to be under the inspectors of factories exclusively.

By this means the duties of inspectors of factories and inspectors of mines will be kept entirely distinct.

(2.) Quarries to remain under the inspectors of factories with the additional powers given to them by the proposed special rules.

In this case the Factory Acts should be made to apply to *all* quarries, not at present included owing to the employment of men only, and the use of no steam, water, or other mechanical power. Manufacturing processes on the surface at metalliferous mines should also be left to the inspectors of factories only. This would provide for efficient inspection of quarries under the Factory Acts, more especially if one or two of Her Majesty's inspectors of factories were told off to institute the special rules in the first instance.

(3.) Quarries and metalliferous mines, with the manufacturing processes attached, to be handed over to the inspectors of mines exclusively.

In this case "clay" should be omitted from the definition of a quarry, otherwise dual inspection will be at once created under the provisions contained in the Factory Acts as to the manufacture of bricks and earthenware and under the special rules lately framed for potteries.

But even then difficulties as to demarcation of duties will arise, whilst the anomaly will be created of some slate and stone works being under the Factory Acts, and some under the Mines and Quarries Acts, with different regulations, unless the provisions of the Factory Acts continue to apply to works attached to quarries and mines, and powers be given to the inspectors of mines to enforce the same.

As soon as ever inspectors of mines include any *manufacturing* processes in their jurisdiction difficulties of demarcation commence.

(Signed) H. S. Richmond.

APPENDIX I.

TABLE showing the NUMBER of PERSONS occupied in the QUARRYING of STONE (including LIMESTONE), SLATE, and CLAY, and also in the MANUFACTURE of PLASTER and CEMENT, in each COUNTY of ENGLAND and WALES, according to the CENSUS RETURNS of 1881 and 1891 respectively.

County.	1881.				1891.			
	Stone Quarriers (including Lime-stone).	Slate Quarriers.	Clay Workers (including Brick-makers).	Plaster and Cement Manu-facture.	Stone Quarriers (including Lime-stone).	Slate Quarriers.	Clay Workers (including Brick-makers.	Plaster and Cement Manu-facture.
ENGLAND.								
Bedfordshire	6	—	477	23	12	—	524	72
Berkshire	7	—	633	9	18	—	583	2
Buckinghamshire	4	1	395	—	20	—	367	—
Cambridgeshire	3	—	381	4	12	—	424	7
Cheshire	483	1	1,887	9	601	7	1,372	6
Cornwall	187	427	2,053	1	727	382	2,451	3
Cumberland	505	84	317	3	725	54	290	12
Derbyshire	1,389	1	597	73	2,114	2	484	60
Devonshire	436	75	777	19	608	53	833	1
Dorsetshire	677	—	624	12	640	—	680	12
Durham	1,968	2	1,614	185	2,523	3	1,612	312
Essex	2	—	1,474	298	74	11	1,255	371
Gloucestershire	332	1	668	1	527	61	544	17
Hampshire	17	—	1,114	100	53	1	961	117
Herefordshire	38	—	177	—	61	—	106	—
Hertfordshire	1	—	397	5	6	—	335	16
Huntingdonshire	—	—	175	—	2	—	102	—
Kent	166	2	4,880	1,943†	209†	4†	3,779†	3,216†
Lancashire	4,673	396	6,359	63	4,836	334	4,723	63
Leicestershire	1,567	20	1,273	34	1,965	7	988	55
London	—	—	—	206*	771*	165*	478*	149*
Lincolnshire	137	—	1,363	20	176	—	998	68
Middlesex	19	3	2,418	24	23†	—	1,002†	53
Monmouthshire	332	1	442	—	506	1	439	2
Norfolk	11	—	960	8	49	—	706	6
Northamptonshire	15	—	613	—	91	—	748	—
Northumberland	638	1	678	71	850	1	715	122
Nottinghamshire	291	—	1,030	86	266	1	762	82
Oxfordshire	33	—	253	—	64	4	237	—
Rutlandshire	1	—	57	—	2	—	24	—
Shropshire	456	1	1,100	4	881	1	1,019	2
Somersetshire	659	14	1,081	18	1,106	16	1,153	18
Staffordshire	623	—	5,001	39	1,298	—	5,117	50
Suffolk	1	—	965	52	23	—	772	50
Surrey	39	14	1,152	7	80†	1†	737†	5
Sussex	20	2	1,590	14	113	—	1,008	48
Warwickshire	310	—	1,308	145	620	18	1,393	180
Westmoreland	74	117	8	—	147	101	3	5
Wiltshire	896	—	283	15	742	—	296	10
Worcestershire	85	—	1,820	1	107	2	2,174	4
Yorkshire	8,700	21	4,700	149	9,445	26	5,198	204
Totals for England	25,801	1,184	53,074	3,641	33,093	1,256	47,392	5,414
WALES.								
Anglesey	11	17	1	—	49	8	1	—
Breconshire	180	1	71	—	179	1	34	—
Cardiganshire	31	67	16	—	82	40	11	—
Carmarthenshire	73	4	138	—	118	5	171	—
Carnarvonshire	1,184	8,408	46	—	1,196	7,661	31	—
Denbighshire	334	621	438	1	364	582	654	3
Flintshire	100	—	177	26	125	3	219	6
Glamorganshire	765	41	812	12	1,207	73	922	9
Merionethshire	284	4,265	84	—	220	3,959	79	—
Montgomeryshire	26	265	53	—	88	153	40	—
Pembrokeshire	76	22	8	—	89	21	26	—
Radnorshire	5	5	1	—	3	1	4	—
Totals for Wales	3,069	13,716	1,845	39	3,720	12,507	2,192	18
„ England	25,801	1,184	53,074	3,641	33,093	1,256	47,392	5,414
Totals for England and Wales	28,870	14,900	54,919	3,680	36,813	13,763	49,584	5,432

* In the Census of 1881 the figures were included in Kent, Middlesex, and Surrey.
† Excluding the county of London.

TABLE showing the NUMBER of PERSONS occupied in the QUARRYING of STONE, LIMESTONE, SLATE, and CLAY, and also in the MANUFACTURE of PLASTER and CEMENT, in each COUNTY of SCOTLAND, according to the CENSUS RETURNS of 1881 and 1891 respectively.

County.	1881.					1891.			
	Stone Quarriers.	Limestone Quarriers.	Slate Quarriers.	Clay Workers (including Brick-makers).	Plaster and Cement Manu-facture.	Stone Quarriers.	Slate Quarriers.	Clay Workers (including Brick-makers).	Plaster and Cement Manu-facture.
Aberdeen	782	6	3	60	2	2,356	1	41	1
Argyll	260	4	685	6	—	274	617	—	1
Ayr	317	100	—	421	1	396	2	559	6
Banff	8	8	—	15	—	61	4	8	—
Berwick	36	—	—	14	2	30	—	7	—
Bute	52	1	1	9	1	38	—	9	—
Caithness	316	—	—	—	—	295	—	—	—
Clackmannan	40	—	—	32	—	89	5	88	—
Dumbarton	195	11	23	58	—	251	7	113	—
Dumfries	169	30	—	19	—	374	4	36	—
Edinburgh	493	218	1	268	9	736	7	252	5
Elgin or Moray	58	—	—	7	—	80	—	5	—
Fife	406	107	—	189	1	615	—	175	1
Forfar	546	—	2	53	2	639	6	57	13
Haddington	40	8	—	70	—	55	—	40	1
Inverness	20	4	—	7	2	59	—	1	—
Kincardine	88	—	—	3	—	131	—	21	—
Kinross	4	—	—	3	—	34	—	—	—
Kirkcudbright	318	—	4	21	—	259	—	10	—
Lanark	1,033	231	12	1,583	28	1,240	22	1,997	50
Linlithgow	108	18	—	55	—	162	—	107	1
Nairn	16	—	—	—	—	13	—	—	—
Orkney	12	—	—	—	—	11	—	—	—
Peebles	13	5	—	—	2	18	—	—	—
Perth	152	—	31	55	2	148	122	60	1
Renfrew	460	24	—	191	6	393	—	283	2
Ross and Cromarty	59	—	—	2	—	61	—	—	—
Roxburgh	38	4	—	8	—	30	—	6	—
Selkirk	15	—	—	—	—	39	—	—	—
Shetland	8	—	—	—	—	37	—	—	—
Stirling	378	63	—	142	—	367	1	211	—
Sutherland	11	3	—	6	—	10	—	16	—
Wigtown	12	—	—	31	—	26	1	24	—
Totals for Scotland	6,463†	845	762	3,328	58	9,327*	799	4,126	82

* These figures include stone cutters and dressers, and apparently limestone quarriers.
† Not including stone merchants, cutters, and dressers, who number 2,591.

TABLE showing the NUMBER of PERSONS occupied in the QUARRYING of STONE (including LIMESTONE), SLATE, and CLAY, and also in the MANUFACTURE of PLASTER and CEMENT, in each COUNTY of IRELAND, according to the CENSUS RETURNS of 1881 and 1891 respectively.

County.	1881.				1891.			
	Stone Quarriers (including Limestone).	Slate Quarriers.	Clay Workers (including Brickmakers).	Plaster and Cement Manufacturer.	Stone Quarriers (including Limestone).	Slate Quarriers.	Clay Workers (including Brickmakers).	Plaster and Cement Manufacture.
LEINSTER.								
Carlow	14	5	2	—	5	—	1	—
Dublin	70	8	44	19	53	—	72	6
Kildare	17	—	4	—	11	—	2	—
Kilkenny	59	11	3	—	31	7	1	—
King's	2	2	36	—	13	—	36	—
Longford	2	—	2	—	—	—	—	—
Louth	17	—	2	—	3	—	2	—
Meath	41	—	3	—	4	—	20	—
Queen's	12	1	1	—	4	—	—	—
Westmeath	1	—	3	—	—	—	1	—
Wexford	14	10	14	—	16	1	4	22
Wicklow	16	—	3	—	22	—	1	—
Total for Leinster	265	32	117	19	162	8	140	28
MUNSTER.								
Clare	51	—	—	—	32	—	—	—
Cork	180	6	13	—	90	29	46	—
Kerry	26	2	—	—	10	—	3	—
Limerick	30	—	8	—	28	—	7	—
Tipperary	62	47	6	—	18	55	1	—
Waterford	4	—	2	—	13	—	11	—
Total for Munster	353	55	29	—	191	84	68	—
CONNAUGHT.								
Galway	1	—	1	—	2	—	—	—
Leitrim	1	—	35	—	—	—	—	—
Mayo	15	—	—	—	2	—	1	—
Roscommon	2	—	—	—	4	—	—	—
Sligo	2	—	2	—	1	—	—	—
Total for Connaught	21	—	38	—	9	—	1	—
ULSTER.								
Antrim	393	7	153	4	149	—	253	13
Armagh	34	—	10	—	43	—	9	—
Cavan	9	—	23	—	—	—	31	—
Donegal	6	—	10	—	2	—	8	—
Down	85	2	88	1	117	—	107	2
Fermanagh	4	—	3	—	4	—	—	1
Londonderry	11	—	8	—	26	—	2	—
Monaghan	—	—	—	—	2	—	1	—
Tyrone	29	2	22	—	20	—	26	—
Total for Ulster	571	11	317	5	363	—	437	16
Total for Leinster	265	32	117	19	162	8	140	28
„ Munster	353	55	29	—	191	84	68	—
„ Connaught	21	—	38	—	9	—	1	—
„ Ulster	571	11	317	5	363	—	437	16
Total for Ireland	1,210	98	501	24	725	92	646	44

APPENDIX II.

TABLE I. (*a.*)

ENGLAND.

TABLE showing DESCRIPTION of STONE, AVERAGE NUMBER of PERSONS employed, NUMBER of DEATHS from ACCIDENTS, and DEATH RATE from ACCIDENTS in certain QUARRIES in ENGLAND.

Name of Quarry.	Description of Stone.	Average No. of Persons employed.	No. of Deaths from Accidents for 10 Years.	Death Rate from Accidents per 1,000 Persons employed.
Manchester Ship Canal Co., Cheshire.	Sandstone.	103	3 in 2 years.	14·56
Runcorn and Helsby Red Sandstone Co., Cheshire.	Sandstone.	201	1	0·49
Old Delabole Slate Quarry, Cornwall.	Slate	400	11	2·75
J. Freeman, Sons, & Co., Cornwall.	Granite	800	2	0·25
Mount Sorrel Quarries, Leicestershire.	Granite	446 for 4 years	3	1·67
Northumberland Whinstone Co., Northumberland.	Igneous rock.	160	2	1·87
Clee Hill Granite Co., Shropshire.	Basalt	300	1	0·33
Clee Hill Dhu Stone Co., Shropshire.	Basalt	200	1	0·5
Field and Mackay, Titterstone Quarries, Shropshire.	Basalt	200	1	0·5

TABLE I. (*b.*)

SCOTLAND.

TABLE showing DESCRIPTION of STONE, AVERAGE NUMBER of PERSONS employed, NUMBER of DEATHS from ACCIDENTS, and DEATH RATE from ACCIDENTS in certain QUARRIES in SCOTLAND.

Name of Quarry.	Description of Stone.	Average No. of Persons employed.	No. of Deaths from Accidents for 10 Years.	Death Rate from Accidents per 1,000 Persons employed.
Admiralty Quarry, Peterhead, Aberdeenshire.	Granite	80	1 for 7 years.	1·77
A. Macdonald & Co., Aberdeenshire.	Granite	35	3	8·57
Heslop, Wilson, & Co., Aberdeenshire.	Granite	30	5	16·66
Kemnay Quarry, Aberdeenshire.	Granite	358	1	0·27
Ballachulish Slate Quarries, Argyllshire.	Slate	390	—	—
Easdale Quarry, Argyllshire	Slate	176	1	0·56
Dalbeattie Granite Quarries, Kirkcudbrightshire.	Granite	260	—	—

TABLE I. (*c.*)

CARNARVONSHIRE SLATE QUARRIES AT WORK IN 1893.

TABLE showing METHOD of WORKING, AVERAGE NUMBER of PERSONS employed, DEATHS from ACCIDENTS, and DEATH RATE from ACCIDENTS.

Name of Quarry.	Method of Working.	Number employed in 1893.	Average Number employed 1883 to 1892.	No. of Fatal Accidents 1883 to 1892.	Death Rate from Accidents per 1,000 Persons employed.
Alexandra	Pit	232	206	1	0·48
Bettws-y-Coed	Galleries	20	15	—	—
Braich	Pit	80	90	4	4·44
Bugail	Pit	00	30	—	—
Cefn Du and Chwarel Fawr.	Galleries	186	175	—	—
Cilgwyn	Pit and Galleries	282	275	6	2·18
Cook and Ddol	Galleries	18	24	—	—
Dinorwic	—	2,590	2,044	19	0·71
Dorothea	Pit	420	486	19	3·9
Foel Llyn	—	3	1	—	—
Gallt-y-Foelwn	—	37	36		
Glanrafon	Galleries	334	190	3	1·57
Glynrhonwy	Pit and Galleries	263	146	1	0·68
Gwernor	Pit	32	7	—	—
Moel Tryfan	—	160	127	3	2·36
New vron Heulog	—	76	67	1	1·49
Penllyn	Galleries	37	32	—	—
Penmachno	—	142	127	1	0·78
Penrhyn	—	2,500	2,500	19	0·76
Pen-yr-Orsedd	Pit	448	440	9	2·04
Prince Llewelyn	Galleries	35	19	*1	2·85
South Dorothea	Pit	126	88	7	7·95
Talysarn	—	310	338	13	3·84
Upper Glynrhonwy	Pit and Galleries	99	103	3	2·91
	Totals	8,477	8,050	110	—

* Included in Mines Returns for 1885. The quarry was then worked partly above and partly below ground. The accident occurred above ground.

TABLE I. (*d.*)

CARNARVONSHIRE SLATE QUARRIES NOT AT WORK IN 1893.

TABLE showing METHOD of WORKING, NUMBER of PERSONS employed, DEATHS from ACCIDENTS, and DEATH RATES from ACCIDENTS in SLATE QUARRIES in CARNARVONSHIRE during the Period 1883 to 1892.

Name of Quarry.	Method of Working.	Average Number employed 1883 to 1892.	No. of Fatal Accidents 1883 to 1892.	Death Rate per 1,000 employed from Accidents.	Number of Years at Work between 1883 and 1892.
Bangor and Carnarvon.	Pit	118	1	1·06	8
Brynfferam	—	5	—	—	8
Bryn hafod-y-Wern.	Galleries	71	—	—	3
Bwlch-y-ddeilior	—	4	—	—	8
Caergors	—	6	1	—	—
Caermeincian	—	8	—	—	4
Capel Curig (Rhos)	—	42	—	—	9
Clogwyn-y-Gwyn	—	3	—	—	3
Coed Madoc	Pit	118	3	3·63	7
Garreg Fawr	Galleries	6	—	—	3
Hafod-y-Wern	—	30	—	—	4
Llwyd Coed	Pit	18	1	6·17	9
Llyn-y-Gader	Galleries	13	—	—	4
Nantlle Vale	Pit	39	1	—	2
Pantdreiniog	Galleries	11	—	—	2
Penybryn	—	162	5	5·14	6
Plas-y-Nant	Galleries	29	—	—	2
Prince of Wales	—	5	—	—	3
Rhiw Bach	—	41	*3	—	5
Tyddyn Agnes	—	7	—	—	2
Tymawr	Pit	No return	1	—	—
Victoria	—	No return	1	—	—
Vale	—	39	—	—	3
Vron and Old Braich.	—	55	3	6·06	9
Chwarel Ddu	Galleries	—	1	—	—
	Totals	848	21	—	—

* Two of these accidents were included in the Mines Returns, as, though occurring in the open, the quarry was worked partly under ground and partly as an open quarry.

TABLE I. (*e.*)

Slate.—North Wales.

Name of Quarry.	Method of Working.	No. of Persons employed in 1893.	No. of Deaths from Accidents, 1883 to 1892, both inclusive.	Description of Stone.
Denbighshire.				
Glyn Slate Co., Denbighshire	Galleries	15	2	Slate.
Llangollen Slate Co., Denbighshire.	Galleries	65	1	Slate.
Pant Glas Quarry, near Llangollen, Denbighshire.	—	Not at work in 1893.	3	Slate.
Totals for Denbighshire -	—	80	6	

Table II. shows that there were on an average 155 persons employed at the open slate quarries in Denbighshire during the 10 years, 1883 to 1892; consequently the average death rate per 1,000 persons employed was 3·87.

Name of Quarry.	Method of Working.	No. of Persons employed in 1893.	No. of Deaths from Accidents, 1883 to 1892, both inclusive.	Description of Stone.
Merionethshire.				
Aberewmeiddaw Slate Co. -	Galleries and pits	40	—	Slate.
Slate Quarry, Cemmaes -	Galleries	16	1	Slate.
Craig Ddu Slate Co. - -	Galleries and pits	203	2	Slate.
Hendreddu Slate Co. - -	Pits -	26	—	—
Maesygamfa Slate Quarry -	Galleries	17	—	—
Manod Quarry - -	—	No return	—	—
Moel Ferna and Deeside Slate Quarries.	Galleries	45	—	—
R. R. H. Lockhart, Ross -	Galleries	35	—	—

The returns for Merionethshire not being complete, no death rate can be calculated.

TABLE I. (*f.*)

Stone Quarries.—North Wales.

Name of Quarry or Firm.	Description of Stone.	No. of Persons employed in 1893.	No. of Deaths from Accidents, 1883 to 1892 inclusive.	Average Number employed, 1883 to 1893.	Death Rate per 1,000.
Carnarvonshire.					
Brundritt & Co., Penmaenmawr.	Stone -	510	5	450	1·11
Darbyshires Lim., Penmaenmawr.	Stone -	100	5	265	1·88
Kneeshaw, Lupton, & Co., Llandulas.	Limestone	254	1	About 250	0·4
Llandulas Quarry Co., Llandulas.	Limestone	39	2	39	5·12
Raynes & Co., Llysfaen.	Limestone	130	4	130	3·07
Syenite Sett Quarry.	Stone -	18	--	—	—
Kneeshaw, Lupton, & Co., Port Nant.	Stone -	150	1	About 150	0·66
Welsh Granite Co., Yr Eifl Quarries.	Stone -	400	2	400	0·5
Nant-y-Porth Quarry.	Stone -	Not at work.	1	About 10	—
Nant-y-Gamer Quarry.	Stone -	At work occasionally	1		—
Totals for quarries named in Carnarvonshire.		1,501	22	1,694	1·208
Anglesea.					
Anglesea Limestone Co.	Limestone	60	—		—
Name of Quarry or Firm.	Description of Stone.	No. of Persons employed in 1893.	No. of Deaths from Accidents, 1883 to 1892 inclusive.	Average Number employed, 1883 to 1893.	Death Rate per 1,000.
Denbighshire.					
Bwlchgwyn Road Stone Co.	Stone -	34	1	30	3·33
Ruabon Stone Co.	Stone -	No return	1	—	—
Chirk Castle Lime and Stone Co.	Limestone	35	—	—	—
Ceiriog Granite Co.	Stone -	101	—	—	—
Craig Quarry -	Limestone	35	—	—	—
Glyn Granite Co.	Stone -	27	—	—	—
Halkyn Lime Works.	Limestone	20			
Llangollen Lime and Fluxing Stone Co.	Limestone	33	—	—	—
Lester's Minera Lime Co.	Limestone	42	—	—	—
Minera Lime Co.	Limestone	150	1	150	0·66
Minera Stone Co. (Rylands).	Stone -	20	—	—	—
Ruthin Stone and Lime Co.	Limestone	15	1	10	10·0
Trevor Hall Lime Co.	Limestone	15	—	—	—
Westminster Free Stone Co.	Stone -	18	—	3	
Totals for quarries named in Denbighshire.		545	4	—	—
Flintshire.					
Chertstone Quarries near Holywell.	Chertstone	18	—	—	—
Lloyd, Jones, & Co., Halkyn.	Limestone	10	—	—	—
J. & W. Bullcock	Stone -	11	—	—	—
Talacre and Gwespyr Stone Co.	Stone -	30	1	30	3·33
Thomas Williams, Talacre.	Scythe Stone.	33	—	—	—
Darwen and Mostyn Iron Co.	Shale -	3	1	—	—
Glanllyn Quarry	Stone -	No return	1	—	—
Totals for quarries named in Flintshire.		105	3	—	—

TABLE I. (*f.*)

Clay and Gravel.—North Wales.

Name of Quarry.	Description.	No. of Persons employed.	No. of Deaths from Accidents, 1883 to 1892 inclusive.	Death Rate per 1,000.
H. R. Bowers, Ruabon, Denbighshire.	Clay -	70	1	1·42
J. Williams, Connahs Quay, Flintshire.	Clay -	15	1	6·66
Peblig Brick Works, Carnarvonshire.	Clay -	23	1	4·34
Gravel Pit, Waenfawr, Carnarvonshire.	Gravel -	No return.	1	—
Gravel Pit, Llanllechid, Carnarvonshire.	Gravel -	No return.	1	—
Manger & Co., Caerwys, Flintshire.	Marl Pit	No return.	2	—

TABLE II.

Table showing the Number of Persons employed at Open Slate Quarries in North and Part of South Wales (compiled from the Annual Lists of Mines).

Year.	Brecon.	Cardigan.	Carnarvon.	Denbigh.	Merioneth.	Montgomery.
1883			[illegible]	[illegible]	[illegible]	47
1884	4		[illegible]	[illegible]	[illegible]	[illegible]
1885	4	18	[illegible]	[illegible]	311	41
1886	4	18	[illegible]	[illegible]	313	40
1887	[illegible]	[illegible]	[illegible]	[illegible]	299	35
1888	[illegible]	[illegible]	[illegible]	[illegible]	334	41
1889	[illegible]	[illegible]	[illegible]	[illegible]	327	39
1890	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891	[illegible]	[illegible]	[illegible]	[illegible]	291	77
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	2,979	500

Table I. (*c.* and *d.*) shows that there were 128 deaths from accidents, exclusive of the three named as having been included in the Mines' Returns, and Table II. that there were on an average 8,335 persons employed at the Open Slate Quarries of Carnarvonshire during the 10 years, 1883 to 1892. Consequently the average death rate from accidents per 1,000 persons employed was 1·535. The average death rate from accidents per 1,000 persons employed at all the mines of the United Kingdom, during the same decennial period, was 1·78.

TABLE III.

TABULAR STATEMENT of ACCIDENTS at the MOUNT SORREL QUARRIES.

	Nature of Accident.	1890.	1891.	1892.	1893, 10 months.
Out-patients treated at surgery, and at their own homes.	Injuries of leg	6	5	16	8
	Do. foot	13	13	18	16
	Do. knee	3	3	3	2
	Do. shoulder	1	1	7	4
	Do. arm	6	4	6	3
	Do. wrist	7	13	14	6
	Do. hand	15	6	23	17
	Do. fingers	34	30	17	22
	Do. chest	4	6	11	5
	Do. back	5	5	8	7
	Do. head	4	6	10	7
	Do. eye	42	69	53	49
	Do. abdomen	—	2	1	1
	Do. testicle	—	—	—	1
	Concussion of brain	—	—	—	1
	Fractured arms	—	—	—	3
	Hernia	9	8	6	10
	Total	149	171	193	162
In-patients treated at the Mount Sorrell Granite Company's Cottage Hospital.	Sprained ankle, followed by phlegmasia.	1	—	—	—
	Crushed foot	1	1	1	1
	Contused abdomen	1 fatal	—	—	1
	Fractured skull	1 fatal	1	1 fatal	1 depressed fracture
	Lacerated arms	—	1	—	—
	Crushed elbow	—	—	1	—
	Crushed hip	—	—	1	—
	Contused back and legs	—	—	1	—
	Crushed knees	—	—	1	—
	Injury to face and eyes (by gunpowder).	—	—	1	—
	Fractured ribs, &c.	—	—	1	—
	Concussion of brain, &c.	—	—	1	—
	Sprained ankle	—	—	—	1
	Total	4	3	9	4
	Grand total	153	174	202	166
	Average number employed	385	424	461	514

Average annual death rate per 1,000 = 1·67 from accidents.

TABLE IV.

TABULAR STATEMENT of ACCIDENTS at the QUARRIES of DARBISHIRES, LIMITED, PENMAENMAWR, 1883 to 1892.

FATAL ACCIDENTS.

Date.	Name, and Description of Accident.
28th Jan. 1881	*Edward Edwards*, an oldish man, setmaker on second bank. Stones loosened by the frost were falling into his bargain. Agent told him to come out of his bargain, and found him some stones to dress on the bank. As soon as the agent left he went back to his bargain, and a stone hit him on his head. He never recovered consciousness
20th Mar. 1885	*Thomas Jones*, on second bank. A body of rock slipped suddenly off a bed, and, falling on the man, killed him.
16th Feb. 1887	*Owen Jones*, driller, on second bank. In loading a hole with powder had not perceived a crevice close to face, into which a lot of powder fell. This powder the fuze ignited, and a slab of rock was blown on to the man, which killed him.
14th Oct. 1889	*Edward Hughes*, driller. The first waggon of the first round in the morning was not coupled up on the incline, and there being no scotch came down the incline. All the men who were waiting to ride up got out of the way, except E. Hughes, who was knocked against a post by the waggon and killed.
24th Mar. 1893	*Owen Jones.* Loading waggons in tunnels under the mill, got crushed while endeavouring to get into a refuge when there was no room.
10th July 1893	*William Williams.* Bringing out his waggon from his bargain, ran on before to see whether the points were right and fell over the rails, the waggon ran over his legs. The injury and shock killed him immediately.

ORDINARY ACCIDENTS.

Date.	Name, and Description of Accident.
1883	*Robert Roberts.* Eye injured.
,,	*Richard Jones*, rockman. Fell into the ropes and hit his head.
,,	*John Jones.* Lost his eye.
1885	*David Davies, jun.* Blown off macadam bin wall and broke his arm.
1886	*Thomas Jones.* Riding up incline in empty trucks, thrown out, dislocated his shoulder.
1888	*William Williams*, head-driller, re-drilling a hole that had missed fire; had his eye burnt, no permanent injury.
,,	*John Lloyd*, driller. Re-drilling hole that had missed fire; burnt his eyes, no permanent injury.
1890	*John Simon.* Letting down waggon on temporary incline with winch; winch broke, injury to jaw.
1891	*Robert Williams*, rockman. While in ropes was hit on the head by a falling stone; no permanent injury.
1890	*Thomas Walsh.* Jumping into a waggon in motion fell between them; muscles of upper leg severed.
1891	*James Ellis.* While charging a hole, the hole exploded and burnt his face; no permanent injury.
	John Jones. Partner of above.
,,	*Edward Watson Jones.* Lost an eye.
1892	*William Thomas.* Fell through the pier and dislocated his shoulder.
,,	*O. W. Roberts.* Riding on waggon down incline, hit his head badly.
1893	*William Jones.* Splinter in eye; no permanent injury.

APPENDIX III. (A.).

MINUTES OF EVIDENCE

GIVEN BEFORE THE

COMMITTEE APPOINTED TO INQUIRE INTO THE DANGERS TO HEALTH, LIFE, AND LIMB.

At the George Hotel, Menai Bridge.

FIRST DAY.

Thursday, 29th June 1893.

PRESENT:

MR. J. HENDERSON IN THE CHAIR.

DR. C. LE NEVE FOSTER.
MR. FRANK N. WARDELL.
HON. W. W. VIVIAN.
MR. W. A. DARBISHIRE.
MR. W. J. WILLIAMS.
MR. J. J. EVANS.
MR. H. S. RICHMOND, *Secretary.*

DR. EVAN ROBERTS, of Penygroes, examined by the Chairman.

Dr. E. Roberts.
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1. You are in practice at Nantlle?—Yes, at the Nantlle slate quarries.

2. How many years have you been there?—For 37 years.

3. And you have had a good deal of experience among the workpeople?—Yes, my practice has been chiefly among them.

4. What do you consider the most dangerous part of the work at the quarries?—Blasting. Very often loose pieces of rock fall down, and sometimes accidents happen owing to the carelessness of the men in not taking proper care with the ropes.

5. Have you considered any plan that might be adopted to prevent these dangers?—No, not in particular. With regard to the rules which have just been put in my hands I think they are enforced in some of the quarries, but if they were carried out more strictly I think many accidents might be prevented.

6. These are the special rules that have been proposed by Mr. Richmond to meet these dangers?—Yes, so I understand. I think these rules are substantially in practice at some of the quarries.

7. And with regard to health, what particular point would you consider might be dealt with?—It is very difficult to say. Our quarries are situated in scattered districts, and many of the men live in the surrounding villages two or three miles off. They have to come in the morning a distance of two or three miles or even more to their work, and a great many do not take proper care in the matter of clothing. They are very often wet to the skin before they are half way to the quarry, and if it continues wet when they get there they loiter about the place, or go into the engine-shed. Standing about in wet clothes in this way brings on pneumonia or some kind of fever. Whilst speaking of fevers I do not think that proper care is taken as to privies and such places about the quarries. Some years ago we traced an epidemic to water which came down from a quarry.

8. What class of disease, in your experience, do these men suffer mostly from?—They suffer chiefly from stomach and lung diseases. Rheumatism is also very prevalent, but diseases of the digestive organs and the lungs are the most common.

9. Is that at all special to their occupation, or is it due more to the general exposure that they suffer from?—I think it is from the general exposure. These diseases are more common among the quarrymen than among the agricultural classes. Our practice extends to the agricultural districts down to the seashore, so that I am in a position to compare the two classes.

10. Do the quarrymen as such specially suffer from any disease arising from their occupation?—I do not know of any. I do not know of any disease peculiar to quarrymen in the way that the chimney-sweep suffers from cancer.

11. Then they do not suffer from any disease that arises from their occupation?—No. The diseases that afflict stone-cutters, for instance, do not apply to quarrymen, as the character of the rock is quite different.

12. Is there any evil at all arising from dust in their occupation?—I doubt it very much, but the

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inhaling of dust might to a certain extent affect them. Some of them take their meals with very dirty hands. Sometimes after working in the sheds they will eat their bread and butter with hands that are far from clean.

13. Of course all these occupations in which the quarrymen are engaged are carried on in the open air?—Yes, they are.

14. And there would be no possible practical means of preventing the dust that they suffer from?—No, I think not. The character of our slates is such that it does not affect them.

15. Is the soil dry?—Yes, practically. Our quarries are different to the Festiniog quarries. They work a great deal underground there, but our quarries work generally in the open. Mr. Darbishire's quarry is an exception. There are several levels there, but as a rule it is an out-of-door occupation in our district.

16. With regard to the sheds, have they sides to them, or are they built with simply a roof?—There are sides. The doors are within a short distance of each other, so that the trucks may be passed backwards and forwards and, the two ends are open.

17. Then they are not places that you would consider it necessary to improve the ventilation of?—I do not know. Perhaps some of the skylights might be opened, particularly when there are not two doors opposite each other. All these sheds are lighted from the roof, but I have never noticed any of the skylights open. The glass is fixed like a slate roof so that there is no ventilation from the roof. That is my experience, but there may be some exceptions.

18. That is to say, the windows are not movable?—No, they are not.

19. Do you know of your own knowledge whether most of the work in the way of sawing is carried on in sheds or in the open air?—They work in sheds. I do not know of a single man who works in the open air in sawing. These are comparatively a recent invention, and a few years ago there was not a single saw in the place. At that time they only cut them.

20. (*Mr. W. W. Vivian.*) You are now, I take it, only speaking of a certain district?—Yes. I am only referring to the Nantlle district.

21. The Nantlle district proper?—Yes.

22. (*Mr. Darbishire.*) You do not mean that the fevers which arise from the privies polluting the water are traceable to quarries as such, do you?—No, not in particular, but I know that there are some parts in certain quarries that are very dirty. The men turn to any little shelter, or they go to an old level. There are no proper waterclosets, or anything of that kind.

23. (*Chairman.*) There are no proper sanitary arrangements?—No, there are not.

24. Are there no medical officers of health in those places?—Yes, for the Union.

25. (*Mr. Darbishire.*) That is not a matter specially connected with quarries; it is common to all occupations, is it not?—Very likely.

26. Do you really mean that there is any want of ventilation in those sheds, or do you think that ventilation would improve the atmosphere as to dust, or as to over-heating?—I believe that ventilation, or an opening at the very highest point, might be of great assistance in releasing the carbonic acid.

27. Do you know that carbonic acid exists there in such quantities as to be inconvenient or perceptible?—No, I cannot say that. I am only giving a general opinion as to these sheds where a great number of men work.

28. The shed I have in view is 90 feet in one direction and 100 feet in another, and about 30 feet high. The skylight does not open, and there would be about 60 men employed there. I want to know if you know of a shed of that kind that wants ventilation. You recommend that skylights should be opened; is it likely to improve the air?—Of course I am not a quarry manager, but I have been to some of these sheds on business, and I certainly felt them rather close. I may say that at the Dorothea there are two engines in the shed, and it struck me, on entering the shed, that the heat from the boiler made it rather too close and heated.

29. (*Chairman.*) How many cubic feet do you consider it necessary that a person should have in a place like that where he works continuously?—Really I am not prepared to answer that question off-hand.

30. The minimum under the Factory Act is 250 cubic feet, but this would give a much larger proportion, would it not?—Yes, these sheds are very different to the woollen and cotton factories. The men do not sit. Mr. Darbishire's quarry is very different. He has a squaring machine, which they have not got in any of the other quarries. In the other quarries they work backwards and forwards while they are sawing. Two or three men put a stone on the table to have it squared and then they split them with knives, but Mr. Darbishire has machinery in his quarry.

31. The regulation that I have spoken of as to the area applies to all factories and workshops, and not to textile factories only. I do not know whether you are aware of that?—Yes.

32. Would you consider that amount of space sufficient; 250 cubic feet for each person?—I doubt very much whether a sawing shed, where the dust rises, is the same. There is great deal more dust in a place like that than in a factory.

33. Have you had any experience of work in a factory?—No, not in particular, but I have often been through them.

34. Have you ever gone through a flax factory?—No, I have not.

35. (*Mr. W. W. Vivian.*) Have any men ever complained to you about there being too much ventilation;—Yes, sometimes.

36. Do they want the doors half shut sometimes?—No, I think not, but sometimes when the wind blows from one direction they move to another corner.

37. Then they have never mentioned to you that there is a too much ventilation?—No, they have not.

38. (*Mr. Richmond.*) All these sheds have doors which are open, I believe, almost the whole of the time?—Yes. I should like to say a word about funerals, before you go any further. It is a very important subject, and I do not know whether you can bring about any improvement, or whether it is outside the scope of the committee. Very often the funeral of a quarryman is attended by 500 or 600 men from the different quarries; in fact, funerals are generally fixed on the most convenient day for the quarrymen to attend. Saturday is very often the day selected. They fix, say 2 o'clock, as the hour for the funeral to start from the house, but there is frequently a delay of half an hour or an hour in starting, and the men during the time they are waiting stand about in the open air, and sometimes in the rain, and catch cold, which develops into serious complaints. From my experience I can say that I have had more cases which could be attributed to exposure at funerals than to working at the quarries.

39. (*Mr. Wardell.*) Are these sheds sub-divided, or are they open from end to end?—I believe they are open from end to end as a rule.

40. And they are pretty long, I suppose?—Yes, Mr. Darbishire has one which is 160 feet long, and another 100 feet.

41. And there are no openings opposite to each other, are there, the doors are mostly on one side?—The men run the slates through.

42. Then there are openings right through?—Yes, there are generally.

43. So that there must be a fair amount of ventilation in those sheds?—Yes, there is, but I believe it would be a great improvement if ventilators were fixed at the top. They might be of great assistance, especially to the men who work close to the engines.

44. Are there boilers in connection with these sheds? Are there boilers in the sheds?—Yes, there

are in some of them, but I believe that at Mr. Darbishire's quarry they have steam power at some distance away. As a general rule the engines are in the shed.

45. With regard to the sanitary arrangements, would not the practice you have alluded to be more likely to affect the people at the other end of the stream than the quarrymen themselves at their work?—When the men do not care to go to a proper place or there are no proper sanitary arrangements in the quarry, the matter percolates, and sometimes they drink the water without for a moment considering whether it is polluted or not.

46. Do you think that any disease arises from dust in the sheds, or from inadequate ventilation?—No, I cannot say that.

47. Do you know of any cases where the lungs have been affected by such causes?—I think it is very doubtful whether there have been any such cases. As far as my experience goes I do not think that lung diseases such as pneumonia, have been more prevalent since sheds were erected than they were before they were erected and when the men worked in the open. A very frequent cause of pneumonia and pleurisy and similar complaints is that men catch cold after perspiring at their work. Men who are partners in the quarry very often work in turns at throwing the sides down and similar hard work, at which they perspire freely, and afterwards they go to lighter work and frequently get a chill.

48. All this has nothing to do with the sheds?—No, it has not.

49. It arises mostly from the weather?—Yes.

50. (*Mr. Williams.*) I belive there was dust there before they erected the sheds, was there not?—No, not very much.

51. Was there no dust then at all?—Very little. There was no sawing then.

52. Did dust arise in dressing the slates with the hand?—Not so much.

53. (*Mr. Wardell.*) The people who work in these sheds do not work there constantly, do they? The same men are not engaged every day in the sheds, are they?—No. I think there are rock men and splitters, as they call them.

54. Do not they change about, sometimes work in the shed and sometimes out?—I do not know, I do not think they do. The rockmen work on the rock, and they supply those on the bank with slabs. Sometimes it takes two men at the bottom to supply one on the bank, and at other times there is only one man at the bottom and two on the bank.

55. (*Dr. Foster.*) Do you think that the men suffer after an accident through not having a trained person, or a person who knows something about ambulance work, to look after them immediately after the accident?—Yes, they do.

56. Do you think that if there were men trained to ambulance work, and having suitable appliances at hand, that the consequences of accidents would be mitigated at all?—Yes, to some extent they would.

57. You believe they would?—Yes, ambulance classes have been formed, and the effects of accidents have been mitigated in many instances owing to the efforts of men who attended the classes; such as hemorrhages and fractures. I remember one case in particular. A man met with an accident at the bottom of the quarry and it was very difficult to get him through the level, but fortunately some of the men had been attending an ambulance class and they took charge of him and brought him up very comfortably, whereas if they had dragged him as formerly he would probably have lost his limb.

58. Do you think, then, it would be a good thing that there should be a certain proportion of men with an ambulance certificate at every quarry?—I do, most certainly.

59. Do you think it would be a good thing to have appliances and bandages in readiness at every quarry? Yes, I believe it would.

60. (*Mr. Wardell.*) You say there are ambulance classes now?—Yes.

61. Which have done good?—Yes, they have.

62. But they have no appliances?—Yes, they have appliances. Mr. Darbishire has a stretcher at his quarry, but the men do not seem to like it. They have got into the habit in our district of carrying those who meet with an accident in a large box on their shoulders. Sometimes they have two or three men in the box with the man who is hurt. Mr. Darbishire has provided them with a splendid stretcher, but the men do not care to use it.

63. Why is that?—It is owing to prejudice. They seem to look upon a stretcher as a thing intended for the dead only.

64. (*Dr. Foster.*) And you say there is a prejudice among the quarrymen in favour of those large boxes?—Yes, there is.

65. Is there any hospital for the men at Nantlle?—No, there is not.

66. Have you anything to suggest with regard to nursing?—I doubt very much whether we could get nurses that would do. The houses are so small. For instance, we had a case not long ago, and Mrs. Darbishire very kindly sent a nurse there, who wanted this, that, and the other that we could not afford, and when she found she could not get them she left at once.

67. You say that the men suffer a good deal through getting wet before they reach their work, and staying about in their wet clothes?—Yes, they do.

68. And that they are in the habit of remaining all day in their wet clothes?—Yes.

69. Do you think it would be a practical plan to do what they do in the Cornish mines, where the men change their clothes before they begin work, in a special shed provided by the mining company; they then work in those clothes, and afterwards change them before they return home? Would that be practicable in the case of quarrymen?—I doubt it very much. In some mines in our district, such as copper mines, they provide the men with oil suits, but the men will not use them. It would certainly be a good thing if they would wear them. The providing of clothes after the men get wet is a very different thing to working in a wet place.

70. I am speaking now of the practice in Cornwall, where the men invariably change and have a working suit at the mine?—It is quite different with slate quarries.

71. But would it be practicable, do you think?—Yes, I should think it would be.

72. The men also suffer from disorders of the digestive system?—Yes, they do.

73. Is that to any extent due to their drinking such a lot of tea?—Yes, and it is particularly due to the mode they have of preparing the tea.

74. Then how do they prepare it?—Men who have a cow or two prefer to take tea in their cans in the morning, rather than milk. They leave it in the cans, and drink out of them at intervals throughout the day.

75. They drink tea that has been standing all day long?—Yes.

76. Without milk?—Yes, generally. They could get plently of sweet milk or butter-milk to drink, but they have got into the habit of drinking tea at every meal. They have no relish for any liquid but tea. It is tea all day long.

77. Does that stewed tea contain a lot of tannin?—Yes, there is no doubt it does.

78. And does that turn the coat of the stomach into leather?—It produces a low kind of inflammation.

79. So that it does affect their health?—Yes; it brings on constipation, which is very prevalent among the quarrymen.

80. (*Chairman.*) It also brings on dyspepsia, does it not?—Yes, and that is the chief disease among the quarrymen.

81. (*Mr. Wardell.*) And that is principally owing to the tea they drink?—Yes, and to their mode of

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living generally. They are very irregular with their meals.

82. Why should the men be irregular with their meals when they have stated hours for them?—Sometimes they do not get them at the proper time. They have very often a long way to go to their work in the morning, and they start their day's work on nothing but a little bread and butter. They do not take enough vegetables with their diet. I have one case in mind at the present moment, that of a quarryman. He does not care for potatoes, simply bread and butter and tea always. He gets meat on Sundays, but during the week he never thinks of taking anything but bread and butter and tea.

83. Do you think the quarryman lives in a poorer way than the agricultural labourer?—Yes; the agricultural labourer eats good coarse flour, which is much more wholesome. The quarryman, on the other hand, eats too fine a flour. The flour is much too fine, and produces constipation.

84. Would it be better if he ate oat-cake?—Yes, it would.

85. (*Chairman.*) Or brown bread?—Yes, certainly.

86. (*Dr. Foster.*) You say that he bakes too white a flour?—Yes, he does. I have often tried to get them to order a sack of brown meal. Some have done so for some time, and they considered that they were very much the better for it, but it was too much trouble, and they did not continue it. When I was at Festiniog 45 years ago the chief food of the quarrymen there was oatmeal, and they were a very much healthier set of men than the quarrymen of the present day.

87. You have just said that the men are slovenly and do not observe the law of washing their hands before meals?—No, they do not.

88. If they do eat with dirty hands do you think that does them any real harm?—No, not slate dust, but there is a great deal of other dust.

89. In what way do you mean?—The men handle slates and tools and different things.

90. Have you any barracks in your district at the quarries?—We have small huts, but as to regular barracks I do not know of any except at Glanrafon Quarry.

91. And are they good barracks?—Yes, but they are very small.

92. Are the men there in the habit of sleeping two in a bed?—Yes, they are.

93. Do you think that a good thing?—No, not in such a small place. They cook their meals there as well.

94. Do they take their meals and cook them in the same room as they sleep in?—Yes.

95. Is that a good thing?—No, certainly not.

96. Do the men suffer from piles?—Yes, they do a good deal.

97. In consequence of their work?—Yes.

98. And through staying in damp places?—Yes.

99. How could that state of things be remedied?—I cannot answer that question. It is a very difficult one. If they took a more mixed diet it would be better for them. If, instead of white flour, they eat brown bread and oatmeal and more laxative food there would be a great improvement. Since the sheds have been in existence, I think hemorrhoids are brought on by sitting continually on cold slate. Those that sit much on slates suffer most from piles, and they are much more subject to that complaint than the men who walk about.

100. Is there any reason why the men should not sit on wood instead of slate?—Yes, they do sometimes.

101. And that would tend to prevent piles?—Yes, it would.

102. What about the houses, are they suitable, or do they suffer from being badly housed?—In some places the houses are very small, but a great many quarrymen have built their own houses. There are not sufficient bedrooms very often, and they sleep three in a bed very often.

103. Three in a bed?—Yes, with children. Families with eight or nine children have often only three beds for the lot.

104. (*Mr. Wardell.*) In how many bedrooms would those three beds be placed?—In some places in only two bedrooms.

105. (*Dr. Foster.*) And you say that nine children sleep in two rooms?—Yes, I know it to be a fact.

106. Would not those matters be put right by the inspector of the district?—I do not know how he could do anything.

107. Then you think there is over-crowding in the quarry districts?—Yes I do, but it is left alone. It is all well enough so long as they keep healthy, but when disease comes, such as fever, they are obliged to go to the neighbour's houses. In cases of scarlet fever I have seen three beds with three children in the same bed.

108. And with scarlet fever in the house?—Yes.

109. Would it not be useful to have a hospital?—Yes, certainly it would.

110. (*Mr Williams.*) You have been speaking about the sheds and other places, and questions have been asked about ventilation. I suppose where there are doors on each side of them you consider there is too much ventilation?—There is no doubt that the wind blows the dust, but I think the sheds would be improved by a ventilator being fixed at the top.

111. The dust rises up to the top?—Yes.

112. And you think that if a ventilator were placed at the top, and the doors at the side were closed, it would be healthier for the men?—I do think so.

113. Has it come within your notice that the place where the men work is colder or hotter than outside in the quarry?—Do you mean in the shed?

114. Yes, in the quarry generally?—I do not understand you.

115. Suppose you go from a farm in the country to the quarry, do you find it colder or hotter at the quarry than at the farm?—Yes, it is much hotter in the bottom of the quarry where the rays of the sun are reflected. If you were to put your hand on the side of the quarry on a hot day it would be almost unbearable.

116. And what is the effect in winter?—It is colder, there is no doubt.

117. So that the variations of temperature in the quarry are more injurious to those working there than is the case with men working in the country?—Yes, no doubt.

118. (*Mr. W. W. Vivian.*) What quarries are you talking off?—Quarries generally.

119. And are you talking about sinks or galleries?—About sinks.

120. Suppose you go to a quarry where there is a gallery, is that affected in the same way?—Yes, but not quite so much.

121. Because there is more draught?—Yes.

122. You say the sanitary arrangements for the men are very defective?—Yes.

123. And that dirt accumulates?—Yes. If there is any shelter in any other place which is not being worked the men go there.

124. And the dirt accumulates?—Yes, but the rain comes and washes it away.

125. (*Mr. Williams.*) Is there any proper accommodation in that respect in any quarry in the Nantlle Vale?—I have not seen any.

126. And you consider it advisable that there should be?—I do, certainly. It is a nuisance as it is.

127. As to the ambulance, you say Mr. Darbishire has one; is there any in any of the other quarries in the Vale?—No, there is nothing in the other quarries except the box.

128. Only the old-fashioned box?—Yes, that is all.

129. What objections have the men in Mr. Darbishire's quarry to the ambulance?—I have been speaking to them about that and inquiring the reason, and their reply was that they preferred the box. When a man is hurt perhaps three or four dozen

take him home. It is almost like a funeral. With a proper ambulance four men could carry him easily, and with much more comfort to the man himself. Sometimes they put two men in the box with him.

130. And as a general rule if a man has hurt his limb they put one man at his feet, and another to hold him up?—Yes.

131. When men are hurt you have no accommodation for them in the way of a hospital?—No, we have not.

132. They are taken home?—Yes.

133. And there is not enough accommodation at home to treat them properly?—Very often there is not.

134. What about the houses; are they well ventilated or badly ventilated?—They vary. Some recently-built houses are pretty well off in that respect. They have windows which open, and chimneys; but in the old houses the windows are fixed, and they have no chimney-pieces except one at each end of the house.

135. Then you consider those houses very unhealthy?—Yes.

136. And they affect the health of the family?—Yes, there is no doubt about it.

137. You have referred to the men going to their work in wet clothes?—Yes.

138. And you consider that unhealthy?—Yes.

139. Would you advise them to leave their work when they get wet rather than remain at the quarry in their wet clothes?—I would certainly, but sometimes they go to their work dry and get wet afterwards. I am referring now to those that live at a distance. They do not like to turn back after having once started, and they stay about hoping that it may get fine.

140. What kind of a place have they to remain in on a wet day?—There is no particular place except the sheds, and some men go to the engine-house where they may dry themselves.

141. They dry themselves, do they, in their wet clothes before the fire?—Yes.

142. What effect has that upon their health?—It brings on inflammation of the lungs or rheumatism.

143. Then, you would recommend these men to have a change of clothing?—Yes, and to get into dry clothes as soon as possible after getting wet.

144. (*Mr Evans.*) I find that in the report of the Registrar-General the average age at death of working males in your district is higher than in the Bangor district; can you attribute that to anything special?—No, I cannot. I am a stranger to the Bangor Union.

145. The quarries in the bottom of the Vale are more liable to have rain than the Dinorwic Quarry?—I know this, that it rains very often at the quarries when it does not rain even at Penygroes.

146. Do you think that is possible for the workmen to get wet feet in the bottom of these quarries, and that that has something to do with their health in general?—There is no doubt that the water does accumulate at the bottom, and they have no proper shoes.

147. Suppose that the men walk through a tunnel in the morning which is not properly drained, would that be dangerous for them?—To be with very wet feet all day is no doubt dangerous to their health.

148. The old huts at Nantlle were closed on both sides and the roof as well. They are different to those at Perrhyn and Dinorwic. Do you consider that there is more dust in the present sheds than there used to be in the old huts?—I think it is more disturbed where there is machinery than where there is none. I have been in the small huts often, but I never noticed the dust rising up in such quantities that you could not see those around you, but I have noticed that in sawing sheds.

149. Do you know that there are some sheds in Nantlle different to those at Mr. Darbishire's quarry, where there are small chambers turning off, and men working in those?—Yes.

150. Are those as well ventilated as the main sheds that Mr. Darbishire has described?—Yes.

151. And you know that there are many of them?—Yes, there are.

152. Do you consider that those are properly ventilated?—No, there is only one door to enter the place, so that they cannot be considered properly ventilated.

153. You have referred to the Dorothea quarry?—Yes, they thought perhaps that it was economical. I do not know of any small closed sheds except in that quarry. Some of them are roughly plastered and others are built roughly with stones.

154. You remember Dr. Williams, of Bethesda, collecting the statements of doctors about the health of quarrymen in general, two or three years ago?—I do.

155. In one of those reports the late Dr. Jones, of Nantlle, stated that he was of opinion that the sheds were the cause of inflamation of the lungs to a greater degree than the old sheds, did you notice that?—Yes.

156. Did you agree with him at that time that cases of inflamation of the lungs were on the increase in the neighbourhood?—No, I differed from him, and I questioned him about it at the time, and he told me that he thought some of those sheds were very draughty, and that some of the men stood between two door-ways. My son and myself could not agree with him in that opinion.

157. I think this is your letter on the subject (*Welsh pamphlet produced*)?—Yes, it is.

158. Will you please translate that portion of your letter which I have marked?—In English it reads thus:—"Inflamation of the lungs is much more common than it has been, and it also proves more fatal. It is produced generally by too sudden a change from a cold to a hot place, and from sudden changes in the temperature.

159. (*Dr. Foster.*) Why should the changes of temperature be greater now than they were formerly?—The quarries are getting deeper now, and there is more working on the sides of them in putting down the sides so as to make them less dangerous.

160. (*Chairman.*) Do you think that the increase in the cases of inflamation of the lungs is caused in any way by an increase of dust?—No.

161. You differ from the late Dr. Jones in his opinion on that point?—Yes, I do. Taking the whole of the quarrymen together, I do not think we get cases of inflamation of the lungs oftener from among the men working in the sheds than among the men working at the quarry.

162. (*Mr. Evans.*) Dr. Roberts, of Festiniog, is of the same opinion as the late Dr. Jones, that there is no proof that it does affect the lungs, but do you consider that the difference in the quality of the Nantlle slate as compared with the Festiniog slate may make a difference in the shape or quantity of the particles?—I do not know.

163. The Festiniog slate is soft, and the Nantlle slate is of a metally nature?—I think it might to a certain extent. I do not know whether the Festiniog slate is softer, but it contains more sulphur than ours.

164. And you think it is therefore more injurious?—Yes, I think so.

165. Do you know of any quarries in Nantlle where the men have fires to go to besides the fires in the boilers?—They have no cabins to go to as they have in the Dinorwic quarry.

166. How do they spend their dinner hour?—In the sheds generally. I do not know that there is any other place for them to eat.

167. And they have no fires to go to except the fires in the boilers?—No, except the office and the machines. They send their cans there. Sometimes you may see half a dozen cans on the fire at a time.

168. (*Mr. Darbishire.*) Do you know of your own knowledge that there are no places for the men to go to?—No, I do not.

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169. (*Mr. W. W. Vivian.*) Have they got any eating houses?—No, to the best of my knowledge there are none.

170. They use the weighing machines as their eating houses?—Yes.

171. And they go to the weighing machines during the dinner hour?—Yes, but a great many of the men take their meals outside.

172. (*Mr. Evans.*) Men are to be seen idling in their huts and sheds during the dinner-hour?—Yes, and standing about in some corner or other in groups.

173. In summer or winter?—Both in summer and winter.

174. Then they do that all the year round?—Yes, and if it is wet they try to get a shelter, but I do not know of my own knowledge that there is any shelter for them.

175. You know there are eating places at Festiniog?—Yes, that plan was brought about after I left that district. At one quarry, Mr. Percival's, they made a very nice place for the men, but they did not seem to appreciate it.

176. Do you consider that the hours of working in Nantlle are too long, or are they so long that it makes a difference between those quarries and other quarries which work half-an-hour or an hour less?—I cannot say anything as to that.

177. (*Chairman.*) What are the hours of working?—From 6.30 or 7 a.m. to 5.30 p.m.

178. And what are they in winter?—They are about two hours shorter. They commence at daylight and leave off when it gets dark.

179. (*Mr. W. W. Vivian.*) It is from 8 to 3.30?—Yes, to 3.30 or 4.

180. (*Mr. Evans.*) Do you know of any quarries in Nantlle that give up working before 4.30 in winter?—No, unless it is dark. When it gets dark they leave off.

181. (*Secretary.*) There is no means of lighting the quarry after dark?—No. They have lamps, but they do not work by artificial light as a general rule.

182. (*Chairman.*) To work at night is exceptional?—Yes, it is.

183. (*Secretary.*) There is no provision for lighting the sheds at all?—They might have lamps placed above the tables, but I have never noticed any.

184. (*Chairman.*) Have you any idea what proportion of the houses would be owned by the workpeople themselves?—I think in our district the quarrymen are the chief owners of their own houses.

185. And do you consider the houses owned by the workmen better or worse than those owned by outsiders?—I think they are better. They look after their own property better than they do after the property of others.

186. Do many of the quarry owners own the houses occupied by their workmen?—There is one that I know of.

187. Is it a large place?—Yes.

188. And are the houses in good order?—Yes, in very good order. I think they are a specimen of what cottages should be. They have been built so well in every respect.

189. What quarry are you referring to?—The Penyrorsedd.

190. (*Dr. Foster.*) That would be an exception I suppose?—Yes. I do not know of a single quarry where a cottage has been built, except the manager's house.

191. At Penyrorsedd the houses are better than the men could get in the open market at that rent?—Yes, I do not know how they can be built to let at the rent they get.

192. (*Mr. W. W. Vivian.*) You have referred to tea, have you suggested to the men that it is bad for them and asked them to change?—Yes.

193. And what did they reply?—It is quite useless to speak to them about it.

194. Then they will not change their habits?—They would rather not change. We have preached to them a good deal about it.

195. (*Mr. Wardell.*) What do you suggest is the best drink for them?—A great many of them keep small farms, and I think it would be far better if they could be got to drink milk. They do not take enough vegetable diet.

196. Generally on Saturday they have a heavy meal, have they not?—No, not in particular.

197. Say at 12 o'clock on Saturday?—I do not think they take anything particular except on the Sundays.

198. I thought they had a heavy meal on Saturdays after they got home from the quarry?—No, not in our district.

199. But you say that on Sundays they do?—Yes, they have better meals on Sundays than on any other day. They take all the meat they can get on the Sunday.

200. Do you mean that they gorge themselves?—No, but it is the only time that they can get meat.

201. (*Mr. W. W. Vivian.*) What meals do they take in the barracks?—They only have tea, but sometimes they take ham or bacon with them from home.

202 But what meals do they have inside the barracks? How many meals a day?—Those that live in the barracks take all their meals there.

203. Do they go to the barracks for there midday meal in your district?—Yes, they do.

204. They do not go into the weighing machine?—No, they go to the barracks if they have them.

205. They eat all their meals in the barracks, those that have them?—Yes.

206. (*Mr. William.*) But there are not many barracks in your district, are there?—No, not many.

207. (*Mr. W. W. Vivian.*) Do they use clogs in your district?—There are some, such as miners, who work in cold places, but they change them in leaving the works.

208. But the miners do use them occasionally?—Yes.

209. (*Mr. Darbishire.*) But quarrymen do not use them?—No.

210. Have you anything to suggest as a plan for providing better food for the quarrymen?—I could suggest it certainly. The plan that Mr. Percival adopted at Festiniog was a good one. He made a large shed and bought a large quantity of vegetables, such as potatoes, carrots, cabbages, &c. He was able to give the men a very wholesome dinner for a very few pence, and they relished it for a time, but they afterwards got tired of it and abandoned it.

211. You suggest that there should be better rooms for eating?—Yes.

212. But that would not provide them with better food?—No.

213. (*Chairman.*) Are there any co-operative societies in connection with the quarries?—We have had some, to our sorrow. They started two or three times in our district, but they always came to grief.

214. (*Mr. Darbishire.*) Has the attitude in which a man sits in splitting the slates anything to do with the hemorrhoids and other diseases?—I think that those men who are engaged in splitting slates for several hours at a time become cramped. They cannot bring their legs very close together; they must keep them apart, and that is not at all conducive to health.

215. The splitter has to put one leg straight out? Yes, and I think that in the winter that is a very cold operation. I think the attitude and what they sit on, both combined, bring on hemorrhoids.

216. (*Mr. Wardell.*) You think the attitude has something to do with it?—Yes, in my opinion it has a great deal to do with it.

217. (*Mr. Darbishire.*) It checks the circulation?—Yes. The chief cause of hemorrhoids is congestion of the liver. You cannot get the liver to act properly without some exercise. I think it has more to do with rheumatism than hemorrhoids.

218. (*Mr. Wardell.*) Do they drink this tea all day long?—Yes, practically, for when they are thirsty they always go to their cans. Many of the men have small tins which they take with them to their work. These tins are divided into three compartments, at one end they have the tea and in another compartment the sugar. They get the water boiled at the quarry, and they have the cans by them all day long.

219. Do they drink at their work?—Yes, when they are thirsty, but they drink water also.

220. Is there any drinking among the men beyond tea as a rule, I am referring now to intoxicants?—They are a much more sober class of men than the colliers; I have had some experience of colliers. But there are of course a great many black sheep among the quarry men as well.

221. With reference to the ambulance work: are you the lecturer in your district?—No, my son is.

222. Is there any fee charged or are the lectures free?—There is a small charge for books.

223. But there is no fee charged for the course of lectures?—I think they make some collection for the ambulance society, but the lecturer is not paid at all.

224. Is there any fee which goes to the society?—There are some collections.

225. And are those collections voluntary?—Yes, but they are expected to contribute something towards it.

226. What number of ambulance men have you in your district?—I think that one session we had from 40 to 50 in the classes, a class for males and another for females were held.

227. Have you renewed the course of lectures?—No, not yet, but I think they are going to renew them. There are men there at present who wish to attend the lectures.

228. (*Dr. Foster.*) Which do you think worst for the men, their work or their mode of life?—Their mode of life, I think.

229. You think that brings about greater evils than his work?—Yes, I think so.

230. (*Mr. Evans.*) Can you tell us what is the nature of most of the non-fatal accidents in your district?—Fractures of limbs.

231. (*Mr. Wardell.*) But what causes those accidents?—Sometimes blasting, and at other times falls of rock and falling of the tops, and at other times they are due to the machinery.

232. (*Mr. Evans.*) Can you give us any idea of the non-fatal accidents to the fatal accidents in your district?—No, I cannot just at this moment. I never report a case of accident unless it arises from blasting, except of course the fatal cases.

233. Can you not give the Committee some idea of the proportion?—No, I cannot. If I had known it was required I could have prepared myself with the figures, but now I am not prepared.

234. (*Chairman.*) Do you think you could arrive at it by having a little time?—We could look through our books and get to know from that source. Sometimes we have cases of compound fracture which take a long time, and sometimes they are only simple fractures.

235. Perhaps you can send to the Secretary a statement on that point?—Yes, I will try.

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236 (*Mr. Evans.*) What would you describe as a serious accident?—An accident which would endanger the life of a person. A simple fracture of the leg I would not describe as serious, but I would call a compound fracture a serious accident.

237. (*Chairman.*) Compound or comminuted?—Compound fracture of a limb is more dangerous than a comminuted; when the air enters within the tissues it involves great danger at once.

238. (*Dr. Foster.*) Then you do not call a simple fracture a serious accident?—No, generally speaking we do not.

239. But you do sometimes?—Yes. It depends upon the constitution of the person; but it is quite an exceptional thing for them not to recover.

240. (*Chairman.*) Could you give us a list of the accidents that have kept the men from their employment, say for a week?—It would take a long time to get that information. There are three or four doctors in the neighbourhood, and I could only give my own figures.

241. I understood you to say that the men do not consume enough vegetables in their diet. Can you give us an idea of what would be a suitable diet for the quarrymen?—I am not prepared to say just at present.

242. But you do consider that they do not eat sufficient vegetables?—Yes. As a matter of fact they do not take any scarcely. It is too much trouble to cook potatoes when they are to be got.

243. (*Mr. Darbishire.*) That is probably want of knowledge?—Yes, principally. The lives of our quarrymen are shortened in consequence of the habit of marrying too young. The other day I was attending a married woman at her third confinement, and she is not eighteen years of age. She cannot be expected to know how to prepare her husband's food. That is perhaps an exceptional case, but the general rule is that they marry very young.

244. (*Mr. W. W. Vivian.*) Is there much intermarriage in your district?—Yes, a good deal.

245. (*Chairman.*) What would be the average wages of a quarryman in your district?—I cannot say.

246. Do you suppose it would amount to 5*s.* a day?—It is very difficult to get the truth from them. If you ask them for a bill they will give you to understand that they earn next to nothing.

247. (*Dr. Foster.*) You say it would be better if they ate oatmeal and brown bread?—Yes. If they spent half the money that they spend on tea and bread and butter in a scientific way they could live on less money and live much better. They are much easier to deal with when they meet with an accident if they have lived properly.

248. (*Chairman.*) When you send to the Secretary your figures as to the fatal and non-fatal accidents, it has been suggested that you should also add a few words as to the general question of diet.—I shall be very pleased to do so, and my son will assist me.

Dr. John William, of Penhryn Quarry Hospital, examined.

Dr. J. William.

249. (*Chairman.*) How many years have you been in practice at Bethesda?—19 years next September.

250. And you have been familiar with the mode of life and the dangers that quarrymen are liable to in connection with their work?—I have.

251. We shall be very happy to hear any views that you have on the subject. What do you consider the most dangerous part of their work? Do you consider that falls of ground are one cause of accident?—It is very seldom the case.

252. Do you think that most of the accidents at the quarry occur from explosives and blasting?—The men are generally protected.

253. But, as a matter of fact, do many of the accidents that occur in your district arise from that cause?—No, very few.

254. Does any insufficiency in the machinery and appliances account for any of the accidents in your district?—I do not think so.

255. Then what do you think yourself that most of the accidents in your district are caused from?—They are due to the men's own negligence and want of attention to their work generally. For instance, with regard to the large cranes that they raise stones with, they do not attend properly to the weight of the stones that they raise, and very often they are over-

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powered and the crane comes down and often injures them.

256. Is it at all a frequent source of injury for the stone to overpower them in lifting?—Yes.

257. And I suppose they are struck with the handle of the crane?—Yes, there are a great many accidents of that sort.

258. Have you any idea what proportion of accidents would come under your notice during the course of a year?—No, I do not think I have.

259. Are there many fatal accidents at the Bethesda quarries?—Yes, there are. Two fatal accidents occurred lately.

260. From what cause?—The last accident was due to the carelessness of the man himself. He was working when he ought not to have been. They were boring in a gallery, and a stone came down from the upper gallery and struck him on the head.

261. Then he remained at his work longer than he should have done?—Yes, the other man who was with him had left work.

262. Is that at all a frequent source of accident?—No, I think not.

263. (*Mr. Richmond.*) I believe you have had three fatal accidents this year?—Yes, we have. The one I have referred to was the last. I forget now what the others were.

264. (*Chairman.*) Have you any suggestions to offer for the better protection of the men?—No, I have not. I have never heard any complaints from the men that they were not protected by the managers or anything of that kind. The accidents were due to their own fault in a way.

265. In regard to their general health, is there anything in which they are engaged in their ordinary occupation which you think affects their health?—I do not think there is. If they could provide themselves with better food in the quarry it would be better for them. The worst of it is that they take a heavy meal at night, and go to bed soon afterwards. They are subject to palsy on that account, and also congestion of the brain.

266. Then you do not think that they regulate their diet properly?—No, not as they ought to do. They eat too heavily after returning from the quarry at night. That is the only proper meal they get during the day, and instead of taking exercise after it they go straight to bed. They take potatoes and meat as a rule with this meal.

267. It would be better for them if they would eat more at the quarry?—Yes, in a way. They are too fond of tea and coffee at the quarry, and never think of taking anything else.

268. In your experience do you find the dust arising from their occupation at all injurious?—I do not think that it is in the least.

269. Have you any sheds where sawing is carried on in your district?—No, we have not, only the huts in which they work.

270. Is the sawing carried on in those huts?—There is no sawing except at the mill. I should say that the men are also prone to apoplexy.

271. Dr. Evan Roberts, who has just been examined, was asked whether he thought the mode of life or the occupation of the quarrymen the most injurious. What is your opinion on that point?—The occupation is not.

272. You think the quarrymen's health depends more upon the manner in which the man lives?—Yes, in a great measure, especially in regard to the question of meals. They take too heavy a meal at night. I was formerly in an agricultural district, and I think the agricultural labourer is more subject to accidents and suffers more from them than the quarryman.

273. Do you think the agricultural labourer is more exposed in his occupation than the quarryman is?—Yes, with the machinery and horses and cattle and so on; I was in such a district before I went to the quarry.

274. Having regard to the weather, would an agricultural labourer suffer more than a quarryman?—Yes, he would.

275. (*Mr. W. W. Vivian.*) What are the chief causes of the accidents that come into your hospital? Falls.

276. And what else?—Loaders meet with accidents, especially in throwing pieces of slate to the waggons. They do not properly estimate the weight of the stones, which very often fall on their feet. We have had several cases of amputation arising from that cause.

277. You say dust has nothing to do with the quarrymen's health?—I do not think it has in anything like the same degree as dust has to do with the health of the miller.

278. Do you think tea-drinking causes any ill-health?—It certainly causes constipation on account of the tannin it contains.

279. A good many of the men frequently attend funerals, I believe?—Yes, they do.

280. Do you think that habit affects their health in any way—standing about at funerals?—Yes, I believe it does. I made that remark myself some time ago in a small pamphlet which I published.

281. (*Mr. Wardell.*) Are there ambulance classes in your district?—Yes.

282. In connection with the quarry?—Yes.

283. And are they working satisfactorily?—Yes, very satisfactorily.

284. Do you find that cases of fracture or bleeding, for instance, are properly attended to on the spot?—Yes.

285. Before they are brought to you?—Yes.

286. And with advantage?—Yes, with very great advantage. In one case which occurs to me they stopped bleeding from the arteries.

287. Which probably saved the man's life?—Yes, it did.

288. How are the sanitary arrangements at your quarries?—I do not think there is anything wrong with the sanitary arrangements.

289. There is nothing deleterious to health, you think?—No, I think not.

290. Do they work in galleries at your quarries, or how?—Yes, in galleries.

291. You have not many accidents which have been produced by blasting or the use of gunpowder in any way?—No, I do not think we have. We have been very cautious with that in every respect. They have every protection with regard to gunpowder.

292. (*Mr. W. W. Vivian.*) You mean the protection of shelter sheds?—Yes.

293. (*Mr. Wardell.*) Have the quarrymen in your district far to go to their work, or do they live close by?—Some of the men have long distances to go to their work.

294. What distance have they to go?—Very often four or five miles.

295. Are they in the habit of commencing their work in wet clothes in bad weather? If they get wet in going there in the morning do they work in their wet clothes?—I think they are allowed to go back to their homes if they are wet. I have never heard that they worked in their wet clothes in our quarries.

296. You do not think that has anything to do with their health, as far as your district is concerned?—No, it has not, but it is quite different at Nantlle. I was there for some years.

297. Then you have had experience in both districts?—Yes.

298. And you say that applies to the Nantlle district?—Yes. They used to take them to the engine house to dry.

299. They went there with their wet clothes on?—Yes, and dried themselves before the fire, but I do not think they do that at Bethesda.

300. You say that in your opinion there is more danger to the quarryman from his mode of life than from his work?—Yes, a great deal.

301. (*Dr. Foster.*) Are there many of your men who live in barracks?—No, not any.

302. Do many of them live in their own houses?—Yes, all of them.

303. I mean in houses belonging to themselves?—No, they are tenants of Lord Penrhyn mostly.

304. Are the houses good?—Yes, very good.

305. Is there any overcrowding in your district?—I do not think there is now. There was when I first came to the place, but there is none now. I could mention places, such as Tanybwlch, where there were houses in the front and at the back, but at present it is different.

306. (*Mr. Williams.*) You have said that the work of a quarryman is not so dangerous as the work of an agricultural labourer?—Yes, and I think I can prove that.

307. Then you do not consider the work of a quarryman dangerous?—No, not more dangerous than a farm labourer's.

308. Are they equally dangerous?—If you take 100 labourers, say in farms in Lleyn, and 100 quarrymen, I say that the labourers are more liable to injuries and accidents than quarrymen, and if you take a 1,000 it is more so. I have attended to both classes for many years and know all about them.

309. Then how do you account for the fact that the men who are loading meet with more accidents than the other men?—Perhaps the slate smashes to pieces in their hands when they are loading, and it cuts their hands and falls upon their feet, because they over-estimate its weight.

310. Why do they over-estimate it?—I do not know. I cannot account for it.

311. Are they practical men. No, the loaders are not practical men. They are mostly men from Anglesey.

312. And do you attribute those accidents to the fact that they are not practical men?—Yes, as regards the loaders.

313. (*Mr. W. W. Vivian.*) You have got waggoners, I suppose, who have been there for eight or ten years?—Yes.

314. Just to lift a stone to a truck, do you consider that about four months would be quite sufficient to become experienced?—Yes.

315. (*Mr. Williams.*) They do not know whether a certain piece of slate will break in their hands or not?—No.

316. But a man who has been brought up to that kind of work would know?—Yes.

317. And such a man would take proper care?—Yes. I have seen young men have their fingers knocked off with the machinery, those men who are not experienced.

318. A quarryman ought to have experience, you think, to keep himself secure from danger?—Yes. It is the same with every new work everywhere, you have ever so many accidents at first.

319. You have told us that you have had two or three accidents at the Penrhyn quarries this year?—Yes.

320. And that they were caused by the carelessness of the men themselves?—Yes.

321. Do you think that those accidents would happen if the galleries were wider?—Really I do not know anything about that. I never attended to the dimensions of the quarry.

322. One of the accidents you have referred to arose owing to a fall from one gallery to another?—Yes, and they had been warned about it. It was the over-anxiety of the man to go on with his work that led to the accident.

323. What kind of places have the men to take their meals in at the quarry?—They take them in the huts.

324. Which are provided by the proprietor?—Yes.

325. And they have proper huts now?—Yes, with boilers and everything requisite.

326. And have they fire there?—Yes.

327. You have said that you do not know anything about the sanitation of the quarry?—Yes.

328. Is there any kind of privies or closets for the men at the Penrhyn quarries?—I do not think there is.

329. What place do they use for that purpose?—The open ground here and there.

330. Then there is no particular place prepared for them?—No.

331. Do you consider that healthy or unhealthy?—There is no harm in it provided they do not drink the water underneath.

332–3. But do they get that water?—They take the water that they get direct from the reservoir. They do not take the water underneath, because that is very likely contaminated.

334. If they took that it would be very injurious to them, I suppose?—Yes, it would.

335. Would you not recommend proper sanitary arrangements for the quarry?—If they could be carried out in such an extensive place as that, it would be desirable.

336. If it could be carried out would you recommend it?—Yes, by all means.

337. It is a necessary thing if it could be carried out?—Yes, but on such an extensive ground as that it would be very difficult to carry out anything of the kind.

338. Do you consider that if a man works in wet clothes it is unhealthy?—Yes, by all means.

339. And as they do in Nantlle, you say, in the way of drying their clothes, that is also unhealthy?—Yes, very.

340.—Do you know whether the men in the Penrhyn quarry, when they get wet, go to the places in which they eat their meals to dry their clothes?—I do not think so. As a rule they go home.

341. Do they go home although it is early in the morning?—Yes, they get leave from the sub-manager.

342. In answer to Mr. Vivian, you stated just now that a great many attend funerals and catch cold there?—Yes, they do.

343. With regard to the houses of the quarrymen; most of them in your district live in houses which belong to Lord Penrhyn?—Yes.

344. And you consider those very healthy houses?—Yes, they are in very good condition, most of them.

345. Are they all in a good condition?—I think they are. They are now improving them.

346. How do they improve them?—In every respect.

347. But in what respect do they improve them?—They make them water-tight in every respect.

348. Do they do anything else?—They cannot enlarge them, of course.

349. Do they improve them in any way except by making them water-tight?—They improve them inside in every respect.

350. With regard to the houses at Brichmelyn, had they proper ventilation formerly?—No, they had not.

351. Have they proper ventilation there now?—Yes.

352. And they are not over-crowded?—No.

353. How many of a family do you think could live in those houses?—A husband and wife and four or five children.

354. You would not consider that too large a family?—No.

355. (*Mr. Wardell.*) How many rooms are there in those houses?—Three.

356. (*Mr. Williams.*) One is a kitchen and another an attic?—Yes.

357. Tell us, if you have five children, how you would accommodate them with sleeping apartments?—There are two bedrooms, one for the husband and wife, and you might put three or four children in the attic easily.

358.—That would be rather like over-crowding, would it not?—No, not with three children, or four.

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359. Lord Penrhyn accommodates his workmen who live at a distance with a special train morning and evening?—Yes.

360. And the distance they go is about four or five miles?—Yes.

361. They travel in trams or carriages?—Yes.

362. Do you consider that injurious to the health of a man who has been perspiring all day long?—Not in the least, provided they are protected with the rugs that they have.

363. Then they have rugs provided them?—Yes, they have.

364. And you do not consider that mode of travelling injurious to the health of the men?—No, I do not.

365. (*Mr. Evans.*) In a large place like Lord Penrhyn's quarry you would expect to find a great many accidents of various kinds taking place from various causes?—Yes.

366. You say that very few accidents happen through falls?—Yes, that is so.

367. What do you mean by falls—falls from one gallery of rock to another—do you mean men falling or the ground falling?—I mean the ground falling.

368. Do you mean a large piece of ground, or do you include stones as well?—I include stones falling from one gallery to another. One man who met with an accident pulled down a stone with his own rope, and that struck him and knocked him over.

369. You do not mean that many accidents happen through large pieces of earth falling?—No. They work that at the uppermost part of the quarry.

370. The Committee include that in their regulation, so that you may understand?—I do not mean the earth falling.

371. You call the earth the top of the quarry?—Yes, and that seldom falls.

372. There are accidents owing to stones falling now and again?—Yes.

373. Do those accidents happen frequently?—No, not very often.

374. You remember you said just now that very few accidents happen through blasting?—Yes, very few, because the men are protected so well.

375. Do you remember the case of David Davies, about 14 or 15 years ago?—Yes.

376. He met with an accident and died owing to the effects of an explosion?—Yes. The man who died recently went to ignite the fuse when the other had not finished off.

377. Do you remember a case happening to a man from Tregarth?—No, I do not remember that.

378. I cannot give you the name, but it happened in Fitzroy about 10 years ago. Two men were injured, and one very seriously. I only want to remind you of the cases. You remember that those cases did happen at the Penrhyn quarries?—I do not remember that case. The recent case that I refer to was due to the man's own negligence. He went to ignite the fuse whilst the other had not gone off.

379. (*Mr. Richmond.*) There were two charges put in at once, I suppose?—Yes.

380. (*Mr. Evans.*) Do you often have accidents arising through cranes?—Yes, the men do not take sufficient notice of the weight of the stone.

381. Do you know that the Penrhyn cranes are arranged to clip?—Yes, but the men do not pay proper attention to that. At Nantlle they are different.

382. But at Penrhyn they have them?—Yes, but they do not attend to them.

383. You say that the men injure themselves with the stones?—Yes.

384. They were not very serious accidents, were they?—Yes, very severe, some of them. In some cases the men had their toes cut off. Lately one man had his big toe cut off.

385. (*Mr. Wardell.*) And that might have a fatal result?—Yes.

386. Particularly if it brought on lock-jaw?—Yes.

387. (*Mr. Evans.*) Sometimes you have all the beds at the hospital full?—Yes.

388. But you do not have them full of men who have cut their hands, I suppose?—No.

389. Then what are the accidents to the other men caused by?—A great many were suffering from disease of the heart and other complaints.

390. It was not so years ago?—No, but there are ever so many now.

391. During the time you have been at the Penrhyn quarry you sometimes had all the beds in the hospital full?—Yes.

392. Can you say what caused most of the accidents to those men?—A great many were brought in suffering from diseases, such as inflammation and so on, and they were kept there for some time. I remember instances of that, and they have been complaining that we have taken too many in who were suffering from disease instead of accidents, and a letter was written to Lord Penrhyn about it.

393. You have had a great many accidents resulting in broken legs and arms?—Yes, we have.

394. Do you think that inflammation of the lungs is on the increase among quarrymen?—Yes, it is the same everywhere. It is quite an epidemic in London just now.

395. Then if it is on the increase it is not an increase locally?—No, it is general throughout the country.

396. (*Chairman.*) You include pneumonia?—Yes.

397. (*Mr. Evans.*) You agree with all the doctors who have written to you, and whose letters you have published in this Welsh pamphlet (*produced*)?—Yes.

398. The late Dr. Jones stated that he believed there was an increase in cases of inflammation of the lungs in consequence of the sheds that had been adopted at Nantlle?—I do not think that has anything to do with it.

399. That would not affect the Penrhyn quarry, at any rate?—No, it would not.

400. (*Mr. Richmond.*) How many years have you been connected with the Penrhyn quarries?—For 19 years.

401. (*Mr. Evans.*) In regard to drinking water at the Penrhyn quarry, you know that a great number of the men are very far from the source of water supply?—Yes.

402. And there are no water-closets?—No.

403. The men must be drinking water that comes from the rock in different places in the quarry?—I have been making inquiries, and I was told by the men themselves that they drink the water that comes from the upper rocks.

404. That is when they get hold of it?—Yes.

405. But some of them are a mile off?—I do not think they drink the water underneath the quarry, such as Glanmeurig.

406. But that is inside the quarry?—Yes, undoubtedly.

407. You think the water at the bottom of Penrhyn quarry is contaminated; the water that oozes from the rock?—There are so many living above.

408. It is only a natural thing?—Yes, there are so many above that.

409. (*Mr. Wardell.*) There are 2,000 or 3,000 workmen above, I suppose?—No, not in that place. There is water at Glanmeurig, at the bottom of the quarry, that I would not like to drink.

410. (*Mr. Williams.*) Do you mean on the left side of the quarry?—The water that comes from the mountain is clear enough.

411. (*Mr. Evans.*) The danger is at the bottom of the quarry?—Yes.

412. And the men at the bottom of the quarry may be drinking the water that passes through these dirty places?—Yes.

413. (*Chairman.*) You have a medical officer of health in your district, I suppose?—Yes.

414. And it would be his duty to attend to any contamination of the water?—I do not think there have been any complaints about it.

415. Bur he would attend to it if the quarrymen complained?—Yes.

416. (*Mr. Evans.*) Can you give any idea of the proportion of fatal to non-fatal accidents in the Penrhyn quarry?—You have the number of accidents.

417. Yes, we have the fatal accidents?—The number of accidents for the last five or six years was sent to you.

418. It is very seldom you have fatal accidents?—Yes.

419. Can you not state what proportion there is of fatal to non-fatal accidents?—No, I cannot.

420. Do you remember what the number of accidents was?—About 560, I think.

421. In what period?—In six years, but some of them were only small cuts. Many come into the hospital and stay just for a day.

422. (*Mr. Williams.*) Do you say that every one of the 560 cases remain in the hospital only for a day or two?—Yes.

423. (*Mr. W. W. Vivian.*) Do you include all of the accidents in that return?—Yes.

424. Illnesses such as gout, or rheumatism, or lumbago?—Yes.

425. (*Mr. Wardell.*) Are the whole of those 560 cases quarrymen?—Yes, men connected with the quarry. Some of the men enter the hospital several times in the course of the year. There was one man who was in the habit of coming in nearly ever other day. He was subject to fits.

426. (*Chairman.*) You mean that there has been that number of admissions into the hospital during those years.

427. From accidents alone?—Yes, and diseases.

428. So the 560 cases include admissions from diseases and accidents together?—Yes.

429. (*Mr. Wardell.*) In fact it includes all admissions to the hospital?—Yes.

430. (*Chairman.*) Is it possible to tabulate those and separate the accidents from the diseases?—Yes, it can be done.

431. And the non-fatal accidents?—Yes, I think I can arrange them.

432. We would like to have the number of accidents which have confined the patients to the hospital for a week, or which have incapacitated him for a week or more?—Yes, I will try to let you have them.

433. (*Mr. Richmond.*) Did you make the return as to the fatal accidents?—Yes.

434. You have made a return of 14 fatal accidents during the last 10 years?—Yes. *Dr. J. William* 29 June 1893.

435. I have the return from the coroner, and he returns the number as 18?—I do not know how he gets at the figure.

436. There was one accident, I believe, in connection with a crane?—Yes.

437. Was the clip used in that case?—No, not properly. They fully intended to have it out.

438. Would you report the accidents from the railway waggons?—I suppose those were outside the quarry.

439. Would you include any accidents outside the quarry in your return?—No, I would not.

440. They would not go to your hospital perhaps? No, they would not.

441. So you would not know anything about them?—No.

442. (*Mr. Darbishire.*) Do you think the clothing of the quarryman is suited to his occupation, or whether, if he wore better clothing or more suitable clothing, he would have better health?—I think it is suitable on the whole. I always advise them to wear flannel in winter and summer, and they do so, but of course they have lighter flannel in summer.

443. Do they actually wear clothing of that kind?—Yes, they do. I must say with regard to the leather strap that I do not approve of it.

444. What is the leather strap?—A stiff leather strap that they use round the waist.

445. You mean a belt?—Yes. It prevents the proper action of the bowels, and produces pressure which causes hernia.

446. Do many of them suffer from hernia?—Yes, ever so many.

447. And are there a great number who use that strap?—Yes.

448. (*Dr. Foster.*) And what would you suggest in place of it?—An elastic strap. The strap they use is made of very stiff leather.

449. (*Mr. Darbishire.*) You do advise them to wear flannel?—Yes.

450. And they do it?—Yes.

451. (*Mr. Evans.*) I believe they dress better in your district than they do in the Nantlle district?—Yes, in their work.

452. And outside as well?—Yes.

453. (*Mr. W. W. Vivian.*) By that I suppose you mean the Penrhyn quarryman goes to his work with a good flannel shirt and drawers?—Yes.

454. Outside that he may have a very holey pair of trousers?—Yes, very likely, but it does not matter if he has good flannel next to the skin. If he has that he is very well protected.

Mr. John Evan Roberts, Chairman of the Moel Tryfan Slate Quarry Company, was the next witness. *Mr. J. E. Roberts.*

Mr. Roberts stated:—My experience with quarries is very limited. I succeeded the late Mr. Hugh Pugh as chairman of the Company four or five years ago, and it is since then that I have taken a little interest in quarrying matters. I shall refer first of all to the fatal accidents that took place in the quarry within the period limited by this inquiry, viz., ten years. These are three in number. I might be allowed to say that these three accidents cover a period of over 17 years. In the first case a man of the name of John Roberts, who had only been working with us for nine days, met his death by falling from one gallery to the other. This man, who was pushing or directing a waggon full of debris before him, instead of using the handle fixed for this purpose at the end of the waggon, got hold of a piece of rock in the waggon, which became loose in his hands, so that he over-balanced himself and fell over the side of the gallery. I would add that the waggon never left the rails, and this to my mind clearly proves that the accident was brought about *entirely* by the man's own neglect. The next is that of Robert Jones, who was killed November 5th, 1887. He again had only been working at Moel Tryfan for three weeks. This man went to work on a Saturday afternoon without the *knowledge* or *sanction* of the manager. It is the invariable custom when any special work is to be done in the quarry, out of the ordinary working, that two men at least should be together. At the inquest it was not clearly shown by what means he met his death, the impression being that a quantity of debris fell upon him, but there was no strong evidence of this, as there was scarcely any outward marks. The third was the case of a man named Richard Hughes, who was killed August 12th, 1888. He was an old workman in the quarry, and met his death by the fall of a stone upon him, which, from all that can be gathered, became loose by the swinging of his rope. I would state from my experience that if the men observed more strictly the rules and regulations,

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scarcely any accidents would occur. Instead of that, in face of repeated warnings, they break the rules and incur serious risks. For an instance, I may mention that about 12 months ago a man was particularly warned by the manager not to work in a certain place, which he considered dangerous. In the manager's absence he proceeded as before; the result was that a quantity of rock fell and broke his leg, and he himself admits had he obeyed the manager's instructions the accident would not have occurred. I might say that as late as even yesterday a quarryman was working in a dangerous place, and instead of putting the rope round his body he only put it round his thigh, and although he was cautioned by the manager several times he took no notice of it. In conclusion I may say from my limited experience of quarries, that if this enquiry will result in inducing the men to observe the rules and regulations of the quarries, and exercise a moderate amount of care, accidents will become very rare. I shall be glad to answer any questions which the committee may like to ask me.

455. (*Chairman.*) Have you any idea of the number of non-fatal accidents that have occurred in your quarry?—No, I cannot speak with any degree of accuracy on that point. We keep no record of minor accidents. One man broke his leg four years ago, but I have not got the exact date. He was working in the top of the gallery and a quantity of debris fell upon him and broke his leg. The second case was that of a man, already referred to, who was working in the same place 12 months ago. This man is now again at work at the quarry.

456. What do you consider a minor accident?—To break an arm or leg. Perhaps one ought not to use the expression, but I use it in opposition to more serious accidents.

457. Would you consider a broken leg a minor accident?—I would, compared with a fatal accident.

458. Would you keep any record of such accidents as broken legs?—As yet we have not done so.

459. Do you not consider it would be advisable to do so?—Yes, it would be, and I have instructed the manager to do so in future.

460. If you kept a record of all accidents which prevented the men from returning to their work, say for a week, it would be a good idea?—Yes, I will see that it is done.

461. Have you seen the draft special rules which it is proposed to frame?—I have only just read them hurriedly.

462. Have you anything to say in regard to them?—I quite approve of the first rule, as to blasting operations—with, say, five minutes instead of ten minutes. We use a bell at our quarry instead of a horn.

463. What about the second rule?—We have three tunnels at our quarry, which I consider the best shelter that can be got for the men.

464. And they are accessible?—Yes, they are close at hand.

465. What have you to say with regard to the rule as to ropes?—I quite agree that the men should use them.

466. Would you approve of such a special rule as this being enforced by law upon the quarrymen, that if they neglected to use a rope properly they must stand a penalty?—I fear myself that some such stringent measure must be adopted, but I hope it will not devolve upon the company to enforce it. The proprietors of the smaller quarries are not so powerful in this respect as the owners of the large quarries.

467. (*Mr. W. W. Vivian.*) Surely you have the power to say to a man "You will be suspended or "dismissed from the quarry if you fail to comply "with our rules"?—I do not think it is customary, and I do not know of a case where it has been done.

468. (*Dr. Foster.*) Would it not be a proper thing to do?—It would certainly.

469. (*Mr. Darbishire.*) You approve of enforcing a regulation of that kind?—Yes, I do.

470. But you do not think that the employer ought to be called upon to enforce it?—I believe the matter ought to be taken up by the inspector.

471. How is the inspector to know that a rule has been broken?—He ought to be furnished with information as to those who disobey the rules, and then he should take proceedings.

472. But before the inspector could be told the man might be killed?—Yes, that is quite possible.

473. (*Chairman.*) You think that the responsibility of reporting such a case should rest upon the employer?—I certainly do, and that stringent measures should be taken to enforce the rules.

474. In some other occupations we have special rules which are applicable to the workpeople, but in that case the responsibility of enforcing the special rules rests with the employers. Do you see any objection to that being done with regard to quarrymen?—The only thing that I fear is that the quarry manager and the company would be held up by the men as being too exact and too particular.

475. Are you aware that this is regularly done in mines?—Yes, I am aware of that.

476. And that it is also done at some of the quarries?—Very likely. It is more difficult to do that kind of thing in the smaller quarries than in the large ones.

477. (*Mr. Evans.*) You would have no objection, I suppose, to being a witness against the men?—No.

478. (*Mr. Wardell.*) You and your manager might be standing by, looking on at a man doing something dangerous, in violation of a rule, and yet not stop him?—The responsibility ought to rest on the man himself. In one of the cases that I have mentioned the man declined to go to the trouble of using the rope properly.

479. But you have it in your power to suspend or dismiss the man?—Yes. If the thing were generally carried out we would of course fall in.

480. (*Dr. Foster.*) If it is done now in regard to 5,000 men out of 8,000 in the county of Carnarvon, would it not be right that the smaller quarries should do so also?—I scarcely think it would be an easy thing to do.

481. (*Mr. Darbishire.*) You say the Government official should prosecute the men for not obeying your orders?—Yes.

482. (*Chairman.*) You think the thing ought to be done, but you are not anxious to take the responsibility of doing it?—That is it exactly. If our manager threatened a man or told him he would communicate with the inspector, I venture to say that would have a greater effect than anything the manager himself might do.

483. What is your opinion as to the fourth rule?—I quite agree with that, but I consider it is rather indefinite as it is now framed, and requires much consideration by those that are more practical than myself.

484. Then you agree with the object of that rule?—Yes, but I would modify it.

485. What have you to say with regard to the fifth rule; that meets the case that we have just been discussing?—Yes, it does.

486. Do you agree that the rule as to three and a half feet should be enforced?—I agree as a matter of rule in general, but I believe it would be very difficult to carry it out in many cases.

487. But if we are to enforce a regulation we must enforce it without exception?—In many cases it would be very difficult to allow three and a half feet, but something might be substituted, for instance a fence.

488. You think there should either be a fence or a space of that width?—Yes, as a rule, but there may be exceptional cases where this is impracticable.

489. What do you think of rule six?—I quite agree that it is very desirable to have sufficient width in proportion to the height, but I am not in favour of having any hard-and-fast rule.

490. And what about rule seven?—That will not affect our quarry.

491. Then as to rule nine, I suppose for your own sakes you endeavour to get practical quarry managers?—Yes.

492. Your manager is a practical man?—Yes, he has never done anything else. He was manager in another quarry before he came to us.

493. On the whole you approve of the proposal that some such rules as these should be adopted?—I do, with certain exceptions.

494. (*Mr. Williams.*) What is the width of your galleries now?—We do not work gallery No. 2. Gallery No. 1 is of an average width of 25 to 30 ft.

495. (*Dr. Foster.*) And what is the height?—About 56 feet.

496. (*Mr. Williams.*) Have you any accommodation for the men in the way of privies or closets?—No.

497. Have you any place for them to take their meals in?—Yes, we have two large sheds.

498. You mean the sawing sheds?—Yes.

499. (*Mr. Richmond.*) They go into the sawing sheds for their meals?—Yes, and they have the privilege of heating their food in the engine-room.

500. (*Mr. Williams.*) Have you any ventilation in the sheds?—There is plenty of air passing through them. There are no ventilators at the top, but there are doors at the sides and at each end.

501. (*Mr. Wardell.*) Then there are no skylights?—No, there is a glass top.

502. But it does not open?—No.

503. Is the sawing done by machinery?—Yes.

504. (*Chairman.*) What height will the roof of the shed be?—It is about 30 feet high in the centre, and from 12 to 14 feet high at each side. One of the sheds will measure about 40 yards by 12, and the other about 35 yards by 16.

505. Is your quarry worked in galleries?—Yes.

506. Entirely?—Yes.

507. (*Mr. Williams.*) Can you tell approximately how many men there are working inside the quarry and how many in the sheds?—For the last 10 years the average number of men working at the quarry has been 160, made up as follows:—Quarrymen outside 39, rubellers 33, drivers and general workmen 23, making 95 and rock men working inside 65.

508. (*Mr. W. W. Vivian.*) What do you call "working out"?—Working in the quarry or on the top.

509. And those who work in the shed you say work indoors?—Yes.

510. What is the number of men you have in addition to the quarrymen and others who work outside?—65.

511. (*Mr. Williams.*) Do the rubellers work inside the quarry or outside?—Partly in and partly out.

512. Where do the 33 work?—Partly in and partly out. There are 65 inside and 95 outside.

513. (*Mr. W. W. Vivian.*) Do you say that the 33 work partly outside?—Yes, part of their time.

514. Have you got any engines?—We have no locomotive at present. We have only the engine which works the sawing tables.

515. (*Mr. Evans.*) Your quarry is now in course of being brought into proper shape?—It is so.

516. What you have said about the width and height of your gallery is not what you intend the gallery to be?—No.

517. What do you intend your gallery should be in width, in proportion to its height, to make it safe?—About half.

518. You think the galleries should be in width what they are in height?—I think the width should be about half. (*See* my answer to Question 517.) You could do with a less gallery with safe rock.

519. You think the quarry would be safe if you had the galleries half as wide as they are high?—Yes.

520. You have tunnels to go to the quarry?—Yes, we have two, and a little cutting.

521. You have no windings at all?—No, we have not.

522. How do your men go to their work at the quarry?—The majority of the men use the tunnel in going and coming to their work, and for their meals. There being no traffic in the tunnel then, therefore they are not liable to accident. They are not *compelled* to go this way; they can go through the little cutting in No. 3 gallery, and then there are steps for them to go down. In the lower gallery a great many go through the tunnel.

523. Along which the traffic is passing?—Yes.

524. Are your tunnels very straight?—One is very straight.

525. And how is the other?—The other is not.

526. Are your tunnels drained?—No.

527. Did you ever have an accident in consequence of the tunnel being dark?—The manager met with a slight accident there about two months ago.

528. Do not you think you ought to have a light there?—There is a light in one part of the crooked tunnel, an opening of the shaft.

529. Does the opening of the shaft give sufficient light to enable the men to see what is coming to meet them?—It does in one part, but not throughout the whole length.

530. Do not you think you ought to have a light there, so that those who walk through it may see what is coming?—If we employed men to bring the debris out it would be advisable to do so, but we employ horses.

531. But the quarrymen must pass through the tunnel?—No, not now.

532. (*Dr. Foster.*) Are there any man-holes for the men to get into in those tunnels?—No.

533. (*Mr. Evans.*) Supposing a man met a waggon in the middle of the straight tunnel, could he pass it safely without a light?—No, not in every part of it.

534. (*Mr. W. W. Vivian.*) Is there any gradient in the tunnel?—Yes, a slight gradient.

535. (*Mr. Wardell.*) There would not be room for a man between the waggon and the sides of the tunnel?—No, the waggons project about 9 inches over the rails.

536. How long is the crooked tunnel?—About 300 yards.

537. And is it level, or is there an incline?—There is a slight gradient, but the gradient in the lower tunnel is more.

538. What about the crooked tunnel?—The gradient in the crooked tunnel is not so much.

539. Are the waggons brought by horses through the crooked tunnel?—Yes.

540. (*Mr. Evans.*) Who do you hold responsible for keeping the bargains safe?—The bargainmen are requested to report anything dangerous to the manager.

541. You expect them to report?—Yes, or if they have no facility for doing so they are to attend to the danger themselves.

542. Would you consider it advisable to make a rule for every quarryman to search his bargain in the morning before commencing to work?—Yes, it would be a very good rule.

543. Do you consider that some of those accidents would have been avoided if such a rule had been in force?—It is very probable.

544. In one of the cases you have referred to the man's own rope brought the stone down?—Yes.

545. (*Chairman.*) Is your quarry visited by the inspector of mines for the district?—No.

546. But it is by the factory inspector?—Yes.

In answer to a question whether I agreed that it was desirable to fence out quarries, I stated that in my opinion it was, when they are abutting on main roads or public footpaths. In the case of Moel Tryfan, there being no main roads or public footpaths, it was unnecessary, as it was only used by the men going and coming to their work, and that my directors would have decided objection to go to the expense.

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Mr. FRANK TURNER, of Carnarvon, examined.

547. (*Chairman.*) You are the manager of the Glynrhonwy Slate Company?—Yes.

548. How long have you been manager?—I have been agent for this quarry for eight years, but I have been more or less all my lifetime connected with quarrying. As far as our quarry is concerned, the accidents have been caused through the men's carelessness. We have not had a fatal accident for a great many years.

549. Of course it is necessary to a certain extent to protect the men from their own carelessness?—It is, but is almost impossible to do so.

550. I can quite understand that, but as far as it is possible it ought to be done?—Yes, and I believe every possible precaution is taken.

551. In your opinion what department will most of the accidents occur in?—They have generally been accidents with ropes. In one case a man was hurt through a fall of a rock, and in two cases men have been hurt through allowing a waggon to come down on their legs. That was a thing that no possible supervision could have prevented.

552. Have you seen the draft rules proposed by Mr. Richmond?—No, I have not.

553. Will you glance through these (*rules produced*) and say what you think of Rule 1?—We carry that rule out most strictly.

554. What do you say as to Rule 2?—We provide the shelters.

555. And are they quite accessible to the men?—Yes, they are all about the quarry.

556. What about Rule 3?—Yes, we are very particular about the ropes. In one accident at our quarry a new rope was broken by a blast which it would have been very difficult to prevent.

557. Do you think it would be any improvement to impose upon the workmen the responsibility of this particular rule?—I think it would. I think it was quite impossible in the case I have mentioned for the manager to know anything about the rope.

558. And you would approve of the rule that the responsibility for the proper use of the ropes would rest with the men?—Yes, I certainly think it would be advisable.

559. (*Dr. Foster.*) Would it not be better that a man should examine his rope before using it, and not use anything that he considers unsafe?—The men supply their own ropes.

560. (*Chairman.*) There would not be any practical difficulty in enforcing any rule in the quarry, would there?—I think not, if a reasonable one.

561. (*Mr. Richmond.*) Do you find any difficulty in getting your men to use the ropes?—No, as a rule they will use them.

562. Supposing a man did not use it, would you speak to him?—Yes, the manager would do so.

563. And if he still refused he would be punished?—Yes, he would be suspended or discharged.

564. (*Chairman.*) What is your opinion as to Rule 4?—We adopt every precaution in that way at present.

565. And as to Rule 5?—In my opinion it is very hard to frame a hard and fast rule on that point. A bargain may work into the galley above.

566. A suggestion has been made that this rule should be supplemented, that there should either be a fence or a space of three and a half feet between the rail and the edge of the stone?—I think a fence would be impracticable, because it would have to be moved on from time to time.

567. (*Mr. Darbishire.*) You put fences at present in dangerous places?—Yes.

568. (*Chairman.*) What do you say to Rule 6?—I agree with that.

569. What is your view in regard to the breadth in comparison to the height?—We have no rule as to that. Ours is rather a peculiar quarry. We are hardly working our upper galleries at all, but the lower part only.

570. Your principal working is in one gallery?—Yes. There is one other matter I ought to mention. In my opinion the ill-health of the men is in a great measure due to the want of proper food. In proportion to the wages they get, I think they are the worst fed men of any class in the kingdom.

571. A suggestion has been made for the establishment of cooking schools. What is your opinion?—I think it would be an excellent thing.

572. (*Mr. Darbishire.*) You have had considerable experience of the militia. Are the militia on duty served better than the ordinary quarryman?—Yes, much better.

575. (*Chairman.*) And practically at less cost?—The militiaman receives a little more than 1*s.* a day, and he gets three quarters of a pound of meat, and one pound of bread daily. He pays himself about 3*d.* a day for other things such as groceries.

574. (*Mr. Darbishire.*) Do you mean to say that the quarryman is not so well fed as that?—No, he is not.

575. (*Dr. Foster.*) You think it would cost about 1*s.* a day for food?—The rations cost about 7*d.* or 8*d.*, and the man himself spends another 3*d.*

576.—That makes 10*d.* or 11*d.* altogether?—Yes.

577. (*Mr. W. W. Vivian.*) You say he gets three quarters of a pound of meat per day?—Yes.

578. And that he is much better fed than a quarryman?—Yes.

579. (*Dr. Foster.*) Does the militia man improve in health during his month's training?—Yes, he does.

580. (*Mr. Evans.*) The quarryman with a family of six could not afford to get that diet?—No, possibly not, but he gets higher wages than the militiaman.

581. (*Mr. Williams.*) There are not many quarrymen who are militiamen?—No, not very many.

582. (*Dr. Foster.*) What is the average wage of the men in your quarry?—It is very difficult to give an average, but the quarryman earns from 4*s.* to 5*s.*, and the labourers about 1*s.* a day less.

583. (*Mr. Richmond.*) In the return I got from you, you say there are 247 men working in the quarry and that there has been no fatal accident?—We have had no fatal accident for years.

584. But the coroner returns one for the 27th May 1884?—I went there in August 1885, and I understood there had been no fatal accident for years before that.

585. (*Chairman.*) You have never heard anything of that case?—No, the accident named happened at the Upper Glynrhonwy Quarry.

586. (*Mr. Richmond.*) You employ about 247 men?—Yes, we have 263 at present.

588. (*Chairman.*) Do you see any objection to rule 8?—No, I cannot see any objection to fence where there are any roads near.

589. (*Dr. Foster.*) But whether there are roads or not?—Yes, quite so, but I think the Quarry Fencing Act provides for that already.

590. (*Chairman.*) On the whole, you think that the series of rules in that form would be acceptable?—Yes, but with regard to rule 5, there is a difficulty of laying down a hard and fast line.

591. But what about the proposed alternative as to fencing, do you agree with that?—Yes.

592. (*Mr. Williams.*) How many of your men work inside and outside respectively?—It is about two-fifths to three-fifths.

593. Two-fifths work inside?—Yes.

594. And the three fifths outside?—Yes.

595. Have you any accommodation for the men in the way of privies or closets?—In the upper part there is no special accommodation, but there is in the lower part.

596. You have a place for them to take their meals?—Not very good at present. We have been in

treaty for the Glan Peris Hotel for some time, and we have now bought it, and we propose to turn the manager's house into a room for the men to take their meals.

597. If it is wet, do you allow them to leave their work, or do they continue their work in their wet clothes?—No, we allow them to leave.

598. (*Mr. Evans.*) What is the nature of the accidents at the quarry which are not fatal?—In one case a boy slid down a rope and at the bottom he called out for help. A man went along the rope to his assistance, but the boy kicked so much that the man fell off. In another case a man was going to his work on a dark morning, and there was a fall of rock, not in the workings, but in a cutting leading to the workings. It injured his back, but he recovered soon afterwards. We then put him to do some light work, and not long afterwards he broke his leg through a waggon. He had defective eyesight, of which he never informed us. Those are the sort of accidents that happen at the quarry.

599. Have you had an accident with the crane lately?—No, we have no crane on the place.

600. Have you a winch?—Yes.

601. Have you had an accident with that?—Only a slight one. I think a man hurt his finger.

602. Was he not struck in his face?—I am not very sure. I have not had any notice of that from the manager.

603. Have you any clip on that winch?—It is a steam winch.

604. I am not referring to the steam winch, but to the hand winch?—Yes, there is one of the ordinary stops that they can use. *Mr. F. Turner.* 29 June 1893.

605. You are working in galleries at your quarry?—We are working mainly one gallery.

606. Are the sides of your quarry, where you leave off working, left very steep?—No.

607. What depth would you consider safe?—The highest depth is about 40 or 45 feet, and the other two galleries are much lower, but they are not worked now.

608. (*Mr. Richmond.*) The gallery you are working is about 45 feet?—Yes. It is perfectly solid rock, in fact too solid in one respect.

609. (*Mr. W. W. Vivian.*) You say there are 90 men working in the quarry, in the return which you have supplied?—Yes.

610. What do you include in that 90?—All the men, labourers, and everything.

611. And the 157, what are they?—They work in the huts and on the bank.

612. What bank?—The quarry bank and the top.

613. The tippers and others are constantly in and out of the quarry.—Yes.

614. You tip into the lake?—Yes.

615. (*Mr. Evans.*) Where do you put the boys, the rubellers?—They are mostly in the huts.

616. (*Mr. W. W. Vivian.*) Are they included in the 90 or in the 157?—They are in the 157.

617. (*Mr Williams*). Do they go into the quarry to look for their slabs?—Not generally.

618. They are most of their time outside?—Yes.

Mr. John Menzies, Menai Bank, Carnarvon, made the following statement:— *Mr. J. Menzies.*

I am a director, manager, and secretary of the Alexandra Slate Company, Limited, managing director of the Llanberis Slate Company, Limited, and have been connected with the management of slate quarries in this county for the last 24 years. I was previously educated as a civil engineer, and I am an associate member of the Institution of Civil Engineers.

I am glad to have the opportunity of giving the Committee any assistance I can, as no doubt it is very important both in the interests of the workmen and the employers that any rules that the Committee may adopt should ensure the object in view, viz., the safety of the men without unduly trenching upon the liberty of the employer to work his quarry in the way he may consider right and proper.

Having regard to the different conditions under which quarries must inevitably be worked, it is easy to foresee that a complicated code of rules of a stringent kind might, in many cases, be not only unnecessary, but might seriously hamper a manager and interfere with the value of the property, to such an extent indeed as to make the working impossible.

Beyond reading the print of Mr. Richmond's proposed rules, and information of a more or less gossiping nature which is current in the quarries, I hardly know to what point you would wish me to give attention, and perhaps I cannot do better than give you my experience in the quarries under my care, and then leave the members of the Committee to put such questions to me as they may think proper, which as far as I can I will be pleased to answer.

I have special rules in force at my quarries and I have had them in existence for many years, with the result that I have had very few accidents and none of a fatal nature among my men, who average from 400 to 500.

I wish to explain, however, that some four years ago we had a fatal accident on the Alexandra Quarry Railway where a young lad incautiously placed himself between a locomotive and a wall, but this had nothing to do with the working of the quarry, and was an unpreventable accident so far as my men were concerned.

During the past 10 years there have been 10 non-fatal accidents in the quarries under my charge as follows:—

I. *Alexandra Quarry.*

No. 1. We have a vertical shaft working by two cages, one going up while the other goes down. A rubbleman, John Jones, after the loaded waggon had started up, was washing his hands in the pool of water in the sump, when the empty cage came down on his back. He knew that the empty cage was descending and brought the injury upon himself by a very foolish act. He was laid up for some months, but got quite well and has ever since been in employment.

No. 2. A quarryman, Edward Jones, was struck by a stone which fell from a waggon ascending the guide ropes. This accident was caused by his sitting down taking his dinner directly under the guide rope, contrary to the rules. The man knew and could see that the hoisting was going on and knew of his danger. He was seriously injured and has since been unable to resume work.

No. 3. A tableman, John Williams, was thrown off the table, a drop of 10 to 12 feet, by an act entirely his own negligence. It was part of his duty to see that a hemp block on a hoisting wire rope was sufficiently large to prevent it going through the pulley, and the block was under his eye all the day, yet he allowed it to become so worn that it did go through the pulley causing a jerk of the wire rope, which threw him down. He was laid up for a few weeks, but got quite well, and has ever since been at his post.

No. 4. A rockman, Robert Pritchard, fell from the face of the gallery whilst removing loose rock, and was injured by a stone falling on him. This accident was caused by his neglect to use his rope, contrary to the rules of the quarry. The accident occurred about six months ago. The man is getting better but is still unable to resume work at the quarry. In connection with this accident, and others of a similar nature, I should like to say a word as to the danger

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of framing a rule making the employer responsible for its observance by the workmen. The rope was there, the man knew how necessary it was to use it, and that in not using it he was breaking a rule of the quarry, and yet he did it. In such cases it will be impossible in any quarry for the management to see that every man uses the ropes, and if a rule is passed which puts any liability upon the employer for the wilful act of the men, I say it would work great injustice. It appears to me that what is wanted is a rule binding the men to take necessary precaution and empowering the employer to prosecute any workman found disregarding it, as a collier is prosecuted for wilfully taking matches into a mine.

These four are the only accidents I have had at the Alexandra quarry during the last 10 years, and during the previous seven years, I had only one. None were fatal. We employ on an average 230 men, and the work is of quite a general all round character, including much untopping and removal of debris. We have also the usual hoisting machinery, both in shafts and in the open, and the usual machinery in the sheds. I think this is a very fair record, and much of the credit for it is due to the men's observance of my rules.

II. *Cefndu and Chwarel Fawr Quarries.*

1. A rockman, Griffith Trevor, was employed enlarging a shaft. A fall had taken place as the result of a blast, and, before resuming work, he had not taken sufficient precaution to pull down all the loose rock and, in consequence, a piece of loose stone fell and struck him. He was laid up for some weeks, but got quite well, and has since been in employment.

2. A rockman, John Davies, was undermining the rock with a crowbar at the bottom of his bargain, when a piece of the rock about two yards above fell upon his hand and cut it off. He was laid up by this accident and other sickness for about 16 months. Afterwards he was taken to the quarry to a weighing machine. This was in my opinion one of a class of inevitable accidents which no rule could prevent.

3. A quarryman, John Ellis, was working in his bargain when a piece of stone from the top of it fell and struck him on the shoulder. It was his duty to examine the top of his bargain according to the rule of the quarry, and his attention was called to this by the manager, but he disregarded the warning and the accident was the result. He was laid up for 15 months and was taken back to the quarry to a weighing machine.

4. A quarryman, John R. Jones, was working in a slate bothy, and had been in the habit of throwing the slate waste on the top of his bothy, instead of conveying it to the tip, as he should have done, in a waggon provided for that purpose. He was warned against doing this, but owing to the weight on the top of the roof the timber gave way and fell on him while at work. He was laid up for some months but is now in employment at the quarry.

5. A quarryman, Robert Jones, in starting work in the morning neglected to fasten his rope on the upper gallery as usual, and when he took hold of it to lower himself the rope, of course, gave way, and he fell to the bottom of the gallery, a distance of 13 yards. He was seriously injured and was laid up for some months, but is now at his work and appears none the worse for his misfortune.

6. A quarryman, John Hughes, after firing a hole on Monday last got on to the gallery above and pulled up his rope after him. After the shot went off he threw down his rope again to lower himself, but instead of throwing down the whole length of his rope he left a coil of two or three yards loose on top. When he took hold of it to lower himself his weight jerked the rope, and he lost the hold and fell to the bottom of the quarry. He has been seriously injured, but is progressing favourably, and there is every hope of his speedy recovery.

There have been six accidents at these two quarries in 10 years, and none were fatal. The average of workmen has been something over 200 (186 at present).

I venture to say that none of these accidents were due to any default on the part of the management. All of them, with the exception perhaps of Nos. 2 and 3, were due to the acts of the workmen themselves. I do not myself see how any of these accidents could have been prevented by a rule enforced by the employer. All the accidents, it seems to me, point to the danger of putting on the employer the responsibility of the observance of rules which the men themselves ought to be compelled to observe.

The principal rules I have in force at the quarries for the prevention of accidents are as follows:—

1. The blasting takes place every hour unless with the special sanction of the works manager. A steam whistle or horn is blown three times, (*a*) for the men to retire under shelter, (*b*) to light the fuze (interval three minutes), (*c*) to resume work (interval two minutes).

2. Shelters are provided for the men where practicable in each gallery. Where this is not practicable, the men have to retire to the gallery above where there is sufficient shelter.

3. I insist as far as possible upon the men using ropes when working in the face of the rock.

4. The works manager is required to survey the top of the quarry and the galleries at short intervals, sometimes daily, especially after frost and wet weather, and the men are also invited to point out to him any anticipated danger from loose or dangerous rock, and these are at once attended to.

5. I allow no person to work under a waggon while it is directly above him, nor permit anyone to ascend or descend in waggons or cages, except for the purpose of fixing or removing the wooden blocks on the guide ropes.

6. The tablemen have strict instructions to regulate the speed of the hoisting engines by a code of signals.

7. No person is allowed to work in the face of the rock in any gallery below where rock is being pulled down from the face of a higher gallery or galleries which is likely to fall over.

8. Where a gallery is narrow and the tramway is laid near the edge, the men working the tramway give warning to anyone working in the gallery below, and no one is allowed to go on working whilst the waggon is passing. I never had an accident from this cause for the last 24 years.

9. I keep a competent man who is directly responsible to me for the efficient working of the machinery, chains, and ropes, whose duty it is to inspect them periodically, and in some cases daily, and who secures the ropes properly at both ends. He at once reports any defects to me, which I attend to.

I think these exhaust the heads which have occurred to me. I have jotted them down as shortly embodying my views, but if there is anything further upon which you would like to question me I shall be very pleased to answer you.

I should like to add that I have perused the proposed special rules for quarries which I understand have been prepared by Mr. Richmond. There are several things I take exception to, I hold a copy in my hand, and I should like to state my objection to the rules in detail.

619. (*Chairman.*) What do you think of rule 1?—The only objection I have to that is as to the time for blasting; 10 minutes is far too long. That would mean an hour and a half or two hours a day. We allow five minutes, and we find there is a very large margin then.

620. Then what about rule 2?—I agree as far as it compels the owner to provide proper shelters, but as to the employers enforcing their use by the men, it is a serious matter for them. In my opinion it would be both unjust and impracticable of working. You cannot use any physical force to drive the men into them, and there is no legal power which we can

make use of. The same remarks apply to rule 3 as to enforcing the use of ropes.

621. But these are suggestions as to rules which it is proposed to enforce?—I understand it is proposed that the employer should enforce these rules. The reasonable thing is that if a man does not go into shelter or use ropes in accordance with the rules, he should be prosecuted, and a rule should be framed for that purpose. What I say, is, that it would be unjust to hold the employer responsible for the wilful neglect or perversity of the workmen. A man might recklessly, in defiance of all rules, bring about the death of himself or fellow-workmen, and it would be monstrous to hold the employer liable in such a case. The proposed special rules may easily bear such a construction.

622. (*Mr. Darbishire.*) You agree that the provision of shelter shall be the duty of the employer?—Yes. The responsibility is, I think, fairly thrown upon the employer to provide shelters, by these proposed special rules he is also responsible for seeing that they are obeyed. That seems a very unreasonable thing to do. It is the duty of the man himself to go into the shelter provided, and to use the ropes.

623. (*Chairman.*) What do you think of rule 4?—I agree with it as far as removing loose stones and dangerous rock, but I certainly disapprove of the loose language of the rule as to seeing that the tops and galleries are well cleared back. It is far too vague and may mean anything or nothing, I think this part of the rule should certainly be omitted.

624. (*Mr. Evans.*) Do you think the over-hanging has anything to do with rock or loose stones falling?—It may in some cases, but over-hanging rock is not necessary dangerous. To pass this rule would stop several quarries which are quite safe. It all depends upon the nature of the rock.

625. (*Chairman.*) What is your opinion as to rule 5?—I take strong objection to it. As to the three and a half feet, so far as I am concerned, I shall have to close some of my galleries if that rule is insisted upon. It is an unreasonable rule in my opinion, as being hard and fast without exception. Three and a half feet is by no means an unreasonable width if it can be arranged, but there are in the practical working of quarries places sometimes where you cannot get that width. The rule I have in operation now is that all tramways which are within three foot six shall have no waggon passed over them without giving the men who work underneath proper warning, but it is the exception and not the rule to work under such circumstances. I consider 18 inches sufficient where no men are working in the gallery under the tramway.

626. We have had this rule under discussion this morning already and an alternative to the proposal as to the three and a half feet has been suggested, viz., that a fence should be provided where that width is impracticable, what do you say to that?—It is a very difficult thing to put a fence, but the suggestion is an improvement.

627. (*Mr. Evans.*) Would it not be very laborious for the men to move up and down?—No, when it is done in special cases only which cannot be obviated.

628. Will the men not venture there and stop there in spite of warnings?—I have not found it so, I think it is highly impracticable to carry this proposed rule out.

629. (*Mr. W. W. Vivian.*) But you do frequently put up rough fencing?—Yes, in special cases.

630. (*Mr. Wardell.*) And that is the alternative we propose to this rule?—I do not see that it is at all practicable without some provision for exceptional cases.

631. (*Chairman.*) What about rule 6?—I hope this proposal will be entirely abandoned. It would lead to endless disputes and litigation, and in effect would be giving the management over to the inspector. I think no rule should dictate to a quarry owner how he should in principle work his quarry, but I agree that if an owner chooses to work his quarry in such a manner as to become dangerous to the men who work under any particular part of it, provision might be made to obviate the danger. But how this should be done is a matter of grave importance, and in my opinion it would be most unfair to leave an inspector as the sole judge of it. If power is given to an inspector to interfere at all, it should certainly be understood that any requirements on his part, involving a change of the plan of working, should be subject to arbitration before competent persons who understand their business before it is enforced. I strongly object to the rule entirely.

632. Have you any rule at all upon that point at present?—No, we have not. If you insist upon that rule you may shut all the small quarries up if the inspector takes a view adverse to our mode of working.

633. (*Mr. Williams.*) What do you consider safe in that direction?—I think that is a question which it is impossible to answer off-hand, so much depends on the nature of the rock and other circumstances.

634. (*Mr. Evans.*) What is your opinion as to sub-rule B?—A man should not be allowed to work while a waggon is immediately above him, but this rule goes much further and would stop their working half the time.

635. When the waggon is passing along there is a great deal of danger of pieces falling out, is there not?—Sometimes, but very rarely indeed in my experience.

636. (*Chairman.*) What is your opinion as to rule No. 8?—I should not fence the top of any quarry unless there is a public footpath near it as provided by the Quarry Fencing Act.

637. (*Mr. Williams.*) How many men have you employed at your quarries?—We have 235 at present at the Alexandra, and 190 at the Cefn Du.

638. How many of those are working on the banks out and how many inside?—I cannot say now. I have sent in a return as to that.

639. (*Mr. Richmond.*) Your return states 167 in and 65 out at the Alexandra?—Yes.

640. (*Mr. W. W. Vivian.*) The 167 work on the bargains outside?—Yes.

641. And where do the 65 work?—In the shed.

642. Do they ever go to the quarry?—Yes, sometimes.

643. Those figures have been arrived at after taking the returns for one day?—Yes.

644. Nothing else?—No.

645. That is all you have to rely upon?—Yes.

646. (*Dr. Foster.*) Will that proportion change much?—No, not much. I counted the men myself.

647. Would that be a fair average, do you think?—Yes, at the Alexandra Quarry.

648. (*Mr. Evans.*) At what period of the quarry month was it that you counted them?—About the commencement of the month.

649. At the commencement of the month would there be more men in than there would be later on?—No, it is different with us to most quarries in the district.

650. (*Mr. Darbishire.*) In the 167 did you include engine-drivers and machine-men?—Yes, I did.

651. There are only 65 out, including slate makers?—Yes, they are all slatemakers in the shed.

652. And the engine-drivers are included in the 167?—Yes.

653. (*Mr. Richmond.*) You return 98 out, and 88 in at the Cefn Du quarry?—Yes.

654. Is that taken from the same source as the other?—Yes.

655. (*Mr. W. W. Vivian.*) The figures were taken for one day only?—Yes.

656. Are there more men working out than there are in at the commencement of the month?—There are more men in at the beginning of the month than there are out. In the case of the Cefn Du the first week or 10 days of the month is very often inside.

657. On the rock?—Yes.

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658. (*Dr. Foster.*) Was this return taken at the beginning of the month?—No; in the middle of the month.

659. (*Mr. Williams.*) It will be a fair average?—Yes; for the middle of the month.

660. You have sheds there, have you not?—Yes.

661. Have you ventilators there?—Yes; we have.

662. Are they at the top?—Yes.

663. Are they open skylights?—No; they are open ventilators.

664. There is not so much dust in the sheds?—No; the dust gets away.

665. Is there much draught in the sheds?—Yes; sometimes.

666. Do the men complain?—No, I have had no complaint.

667. Have you a place for the men to take their meals in at the quarry?—No; except in the shed. I have no particular place. I am rather discouraged in getting such a place. I offered the men to get them a building and to make arrangements to get them hot dinners, but they did not seem to care for it.

668. Is there any accommodation in the way of closets?—None at all.

669. What about the men who work inside?—They go out.

670. They do go out?—Yes, certainly.

671. You are very high up on the mountain?—Yes.

672. And you get a great deal more rain than we do down below?—Yes, I think we do.

673. Do you keep them there when they get wet in the morning? Do you force them to remain there?—I force them to remain up to a certain time of the day, but I do not force them afterwards.

674. You allow them to go home afterwards?—Yes, but not the men in the sheds.

675. (*Mr. Wardell.*) Do your men, as a rule, live at a distance from the quarry?—Yes, and some at a considerable distance. It is very few who go home when they are wet during working hours unless they are stopped, and a regular wet day sets in.

676. I suppose they get wet on their way to the quarry sometimes?—Yes, they do.

677. Do they start work if they are wet?—If they are very wet they go home.

678. And they are allowed to go home?—Yes. If a man gets wet, and it clears up, as a rule he remains at his work.

679. (*Chairman.*) If a man made application for leave to go home, would you refuse him?—No, not if he is wet, and as a rule we never refuse permission to men to go home.

680. (*Mr. Evans.*) In the statement you have just read you stated you keep a man to attend to the machinery and examine it?—Yes, I do.

681. Does he make reports to you about the state of the machinery?—Yes, verbally.

682. Does he do that regularly or at specified times?—No, only when he finds something wrong.

683. Does he look after them continually?—Yes, he does.

684. Do you find that plan to answer?—Yes.

685. You believe it is a safe thing and a good thing?—Yes, it is. He looks after all the chains and ropes and everything of that kind, and he has at once to report defects to me.

686. Do you attribute the small number of accidents you have had to some extent to that plan?—I do not know that I can say that. It think it is perhaps one of the most important rules that could be adopted with regard to the working of machinery, that there should be periodical inspection of it by a man competent to do so.

687. You have had considerable experience in various quarries, and perhaps you would tell us what slope you consider safe in the Moel Tryfan quarries to keep them from falling in a great mass?—That depends upon what side you are referring to. I should say about 40 degrees on the north-west side.

688. You mean 40 degrees from the perpendicular?—Yes.

689. And that would be 50 degrees from the horizon?—Yes.

690. What about the other side?—It will do almost perpendicularly, in my opinion. It is quite as safe in my opinion as 40 degrees on the other side.

691. For what depth?—Say four or five galleries.

692. And each gallery of what?—45 feet.

693. And you think it is necessary in ordinary quarries that they should stand at an angle of from 40 to 45 degrees?—Yes, where there are croppas or large loose slants dipping into the quarry, as in the north-west side of Moel Tryfan. In many of the other quarries in the district they are perfectly safe with perpendicular sides, and in some cases with overhanging rock. Everything depends upon the nature and quality of the rock. I can only add that after 24 years' experience in the management of slate quarries in this district without a single fatal accident, and with such freedom from non-fatal accidents as I have already shown, I fail to see the necessity of extending the official inspection, or the making of any special rules. The accidents that do happen are nearly always the result of carelessness on the part of the men themselves, which no rule or inspection would prevent, and there is a great deal of danger in trying to work the various quarries under a fixed code of rules, such as is proposed, when undoubtedly each quarry must be worked having regard to its own particular circumstances.

Dr. R. H. M. Robers.

Dr. R. H. Mills Roberts, surgeon to the Dinorwic Quarries and Hospital, Llanberis, made the following statement:—

In reply to the question whether I consider a Dinorwic quarryman's occupation healthy or unhealthy, I have no hesitation in stating that I consider this occupation to be very healthy, indeed exceptionally so. In making this statement I am looking at the subject from two aspects:—

(1.) The character of the work.

(2.) The conditions under which the work is carried out.

1. The character of the work is on the whole decidedly healthy. The Dinorwic quarryman works in a healthy, bracing atmosphere. It has been stated that the quarry atmosphere contains an amount of slate-dust, which is injurious to the health of the quarryman. The air no doubt contains a small percentage of slate-dust, but it is certainly not enough to be of any pathological consequence. Practically it may be said not to exist, as anyone can find out who takes the trouble to walk through the quarry.

I shall now prove that it does not exist to any injurious extent. The result of constantly inhaling slate-dust would be to produce phthisis, or consumption of the lungs. But phthisis is not more common among Dinorwic quarrymen than it is in the majority of other parts of the country, indeed, from the tubercular appearance of the children and youngsters who supply the quarry with its future quarrymen it is not nearly so prevalent as one might expect it to be.

Two things that attract the attention of a doctor newly arriving in Llanberis, Llanddeiniolen, and neighbourhood are:—

1st. The tuberculous aspect of the children.

2nd. The large number of old men employed in the quarries.

I can only reconcile these two contradictory facts by realising and acknowledging that these men must have passed their lives in a healthy locality, and must have been employed in a healthy occupation.

Bone, joint, glandular, and other tubercular affections are common among the children; but these diseases are not common among the men, though you can still trace the tubercular aspect here and there, especially among the very young set, but it is not now so marked. In fact the majority of the boys improve greatly in appearance after their admission to the quarry.

Tubercle is the commonest cause of consumption, and a good number of the men have a tubercular predisposition. Why then does not the tubercle develop far oftener than it does? It is evidently dormant, and under favourable conditions it would wake up. A very favourable condition would be the constant inhalation of slate-dust; but it seems to have no effect, and yet the inhalation of slate-dust will produce the very condition where tubercle will thrive, *i.e.*, a low inflammatory condition, and this too in an organ, the lung, where the growth and development of tubercle is very common.

Again, among acute diseases, acute pneumonia, *i.e.*, acute inflammation of the lungs, is fairly common among the quarrymen. Assuming that a man gets over the acute stage the greatest danger is that he may develop chronic pneumonia or phthisis. A man with a predisposition to tubercle is more likely to develop this phthisis, especially if his lungs are in a low inflammatory condition due to inhaling slate-dust. But my experience is that among the Dinorwic quarrymen phthisis following pneumonia is very rare, in fact I cannot remember a single case. I may here add that I have never seen pneumonia cases do so well as among the Dinorwic quarrymen and this often under very unfavourable circumstances.

From the above facts I think it is proved that slate-dust does not exist at the Dinorwic quarries to an injurious extent. And further, my experience is that, as a rule, there is a marked improvement in many after admission to the quarry (as mentioned above).

The character of the Dinorwic quarryman's work allows free play for bone and muscle, it is only in exceptional cases that he works in a cramped position. The work is no doubt laborious, but not too much so, it is in fact well calculated to develop great bodily strength, and one would expect to find an exceptionally strong and healthy race, of good physique. But this is not altogether the case. The men are no doubt well above the average stature, but their muscular development is very poor and their health is not what it should be. Indeed they are far from doing justice to the healthy character of their work and the healthy position of the quarry. The cause of this is not far to seek, and is due to the conditions under which the work is performed.

These conditions are:—

(1.) Food. (2.) Clothing. (3.) Sanitation.
(4.) Weather. (5.) Early Marriage.

A quarryman's food is, as a rule, very poor, and his clothing is not much better. The weather is no doubt at times somewhat severe, especially in some parts of the quarry, and the quarryman ought to be fortified against this uncertain weather, but he will not, or at any rate does not feed or clothe himself as he ought to.

As a rule (there are exceptions) his food consists of four meals—

Breakfast, early	Tea, bread, a little butter.
Dinner	Same.
Tea	Same.
Supper	Same.

Sometimes he may have in addition a little cheese, potatoes, or bacon, but this is the exception. On Sunday he feeds a little better.

The above diet is not nearly nutritious enough, its effects are indigestion, and a soft flabby ill-conditioned state of the muscular system. It is quite an exception to find in the Dinorwic quarryman a good firm and well-developed muscle. This diet does not produce sufficient warmth, neither does it nourish the muscles. The Dinorwic quarryman finds he cannot work on bread with his meagre supply of butter, and therefore endeavours to stimulate himself by means of tea. This he does at least four times a day, sometimes oftener, and so in time ruins his digestive system. He takes very little fat with his food, but prefers to have it prescribed as a medicine in the shape of cod liver oil, which is supplied to him at the hospital at cost price.

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The Dinorwic quarryman clothes himself thus,—first comes a thick flannel vest; next, a flannel shirt generally lined. He wears flannel drawers, usually double thickness round the waist, and in addition he generally also wears round the waist a flannel belt or bandage. The amount of flannel he wears is excessive, but the reason is no doubt that he feeds so badly that he cannot afford to lose any heat by radiation. All these flannels he wears day and night for a week or a fortnight or even three weeks, the former in summer and the latter in winter. It makes no difference how much he perspires, or whether he gets wet. In either case he goes home and sits in these cold clammy flannels until bed-time, when he sleeps in them, and the next day he repeats the process. If very wet he may dry them by standing in front of the fire. He practically has no protection against the rain; he merely carries an umbrella and fancies his head is the only part of the body that requires protection. One of the sights of Llanberis and Llanddeiniolen on a wet day is to see the men returning from their work each with his umbrella. His food has already produced a soft flabby muscle, but he is not content with that, but sits for hours with a cold and wet flannel next his already tired muscles. He pays me a visit to the hospital shortly and wonders that he has muscular rheumatism.

The Dinorwic quarryman's sanitation is not what it should be. He washes his face, arms, hands, and neck; he also sometimes washes his feet and legs, but that part of the body between the shoulders and knees is never molested.

The Dinorwic quarryman will not open his windows. Fresh air in his bedroom is quite beneath his notice, though, as I have mentioned above, he perspires freely in his flannels, and sleeps in them; he, however, inhales the resulting atmosphere with perfect equanimity, and fancies that this foul air is far healthier than the slate-dust which exists in such infinitesimal quantities in the quarry.

Early Marriage.—The Dinorwic quarryman often marries at too early an age—20 or younger. He marries a girl who is possibly younger than himself and even more inexperienced. She knows nothing of cooking, having never been taught, and if she is anxious to learn, she will do so at the expense of her husband's digestion. But as a rule she is not ambitious in this direction, and is quite content to go on the old lines, tea and bread and butter. The husbands think it is all right, so they do not trouble any more about it. In ordinary health this is very bad, but it becomes very serious in case of illness, for as a rule the women have not the faintest idea how to make attempt at an invalid dish. Now that cooking classes are being started, I think (if I may suggest) it would be very advantageous if not only cooking for healthy people were taught, but that the women should be also taught to make a few invalid dishes.

Another effect of early marriage is that the resulting family is badly developed, and so helps to produce the tuberculous aspect which is so noticeable among the children, but which, thanks to the healthy character of the work and neighbourhood, becomes less marked as age increases among those that are employed in the Dinorwic quarries. These tuberculous children are often the supply that the quarry draws from. It is indeed astonishing that the quarryman is as healthy as he is, but he has to thank the locality and character of the work, and not himself. Intermarriage is also far too common. Near relations and tuberculous people intermarry freely, and the quarry supplies a convalescent home

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for the resulting families when they are old enough and fortunate enough to be taken in.

The position of my house, I think, would give a fair average sample of Dinorwic quarry climate, and I can only speak with the greatest enthusiam of the benefit my health has derived since my residence here. My opinion is confirmed by many medical friends, who, when run down by hard work, make use of my house as a kind of "convalescent home." They come from various parts of England, and are attached to large hospitals. They all wish that their patients lived in as healthy a spot, and were engaged in as healthy an occupation as the men working in the Dinorwic quarry. After a long experience as resident medical officer at various large hospitals, I can sympathise with the wish of my friends, and I often think what marvellous results would be shown at the large hospitals if all the patients they treated lived and worked in a similar place to the Dinorwic quarries.

In conclusion, I think that the health (as a rule) of a properly clothed man working in the Dinorwic quarries, with a good and plentiful supply of food, would not only be sustained but greatly improved. In fact, the men employed at the Dinorwic quarries ought to be, and with proper feeding and clothing would be, one of the finest races in the world.

694. (*Chairman.*) How long have you been in practice in Llanberis?—A little over three years

695. Had you had any experience in Wales before that?—Yes, a little.

696. Have you prepared any statistics in regard to the quarry?—No, I have not.

697. Have you made any comparative statement showing the deaths from phthisis and so on?—No. I have been resident in various parts of England, in different hospitals, and I am simply looking at the average quarryman here compared with the average workman elsewhere. Phthisis is not more prevalent here than in the majority of other places.

698. That is your opinion?—Yes.

699. Have you formed any opinion as to why it has increased of late years?—No; but it will go on increasing unless they have better food.

700. Then you think the employment has nothing to do with it?—No, it is the healthiest possible employment.

701. They use white bread to a great extent?—Yes; quite forgetting that white bread is not so good as brown. They find that white bread is not nutritious enough, and, therefore, stimulate themselves by tea-drinking.

702. And they stew it?—Yes.

703. (*Mr. Richmond.*) And in most cases it is a cheap form of tea?—I cannot answer for its quality, but they often pay a high price for it.

704. (*Chairman.*) With regard to the practice of attending funerals, have you noticed anything special?—Yes, the practice is frequently followed by severe illnesses.

705. Has there been anything like an epidemic of pneumonia amongst the men at Llanberis lately?—No. Latterly we have been comparatively free from that complaint.

706. It is your opinion that more evils arise from the conditions of their life than from the conditions of their employment?—Yes, absolutely.

707. They do wear a considerable amount of flannel?—Yes, too much, and that is because they do not feed properly. The food they eat does not give them sufficient heat, and they make up for it by using too much flannel.

708. At about what age do they enter the quarry usually?—At about 14 years of age. With regard to the causes of death in my neighbourhood, it may be of interest if I produce one of my books of counterfoils of death certificates, containing 52 consecutive cases. Of course, they are neither picked nor chosen, and may be taken as fairly representative:—

Age.	Cause of Death.	Age.	Cause of Death.
77	Old age.	24	Phthisis.
78	Do.	41	Cancer.
89	Do.	44	Do.
80	Do.	70	Old age.
19	Hernia operation.	67	Cancer.
89	Old age.	52	Apoplexy.
63	Effects of accident.	33	Phthisis.
39	Pneumonia.	70	Old age.
82	Old age.	80	Do.
79	Do.	45	General tuberculisis.
77	Do.	24	Influenza.
76	Do.	59	Pneumonia.
78	Do.	37	Hæmorrhage from womb.
58	Phthisis.		
33	Do.	57	Cancer.
90	Old age.	57	Phthisis.
54	Phthisis.	65	Cancer.
64	Heart disease.	72	Old age.
75	Old age.	59	Cancer.
4	Scarlatina.	26	Pneumonia.
17	Phthisis.	48	Phthisis.
79	Old age.	8	Typhoid.
63	Cancer.	80	Old age.
75	Old age.	88	Do.
72	Do.	48	Pneumonia.
69	Do.	66	Old age.
55	Cancer.		

Note.—The witness has since prepared an analysis of these certificates, which is as follows, viz.:—

Of 52 cases referred to, 41 who have worked in quarry;
„ „ 11 who have not worked in quarry.
Average age of 52 was 58·7.
„ „ 41 was 62·2.

Of the 41,	21	died from	old age; average age,	77·3.
„	6	„	cancer; „	58·3.
„	4	„	pneumonia; „	43.
„	5	„	phthisis; „	41.
„	5	„	various causes; „	44·4.

709. Are those cases that you have attended to?—Yes, in Dinorwic and neighbourhood.

710. Is there anything to account for the large number of deaths from cancer?—Not that I know of. It is more prevalent in the stomach. Their diet predisposes them to a low inflammatory condition, and possibly that may have something to do with it.

711. Have those deaths occurred during the last three years.—Yes.

712. (*Mr. Darbishire.*) There is said to be a good deal of disease of the liver and hæmorrhoids, is that so?—That is not a fact. They call things piles that are not so in reality. My experience is that hæmorrhoids are not at all common. The men come complaining of piles, but they turn out not to be piles.

713. The evidence was that there was a great deal of stomach diseases and hæmorrhoids?—My experience is the other way, so far as hæmorrhoids are concerned. Stomach diseases are common, of course.

714. (*Mr. W. W. Vivian.*) Your experience of cases of real piles is very small?—Yes, among the Dinorwic quarrymen.

715. A good many come to say they have that complaint who have not?—Yes, but I find very often that it is only a skin eruption and itching, or irritation caused by small intestinal worms.

716. (*Mr. Williams.*) How do you account for the itching?—Want of cleanliness chiefly.

717. (*Mr. Darbishire.*) Is there anything in the attitude which a man assumes in splitting slates which produces disease?—It would only give him a backache, and that would be helped by the practice of wearing damp flannels around the waist, instead of dry clean flannels.

718. (*Chairman.*) Are the majority of the cases of cancer among the male or female population?—My practice is chiefly among the male population, and the majority of the cases of cancer I have seen have been among the men.

719. That is rather contrary to the general experience, is it not?—No. Cancer is equally

prevalent among males and females; that is apart from the breasts and generative organs. Cancer is absolutely far more common in women than in men, simply because cancers of uterus and mammary constitute by far the largest proportion of these diseases, being much more common than cancers of the male organs.

720. How many patients have you in your hospital?—We vary a good deal.

721. What is the average number?—I am afraid I can't give an average, because sometimes we are for months without a single patient.

722. You have a dispensary as well, I suppose?—Yes, we have.

723. What is the average number of patients there?—Sometimes we have 10 or 12 a day, and very often less, but when the influenza was prevalent we had over 100 a day.

724. (*Mr. W. W. Vivian.*) What was your number of attendances last year?—Between 6,000 and 7,000, including accidents and dressings and medical attendance.

725. That is for the whole year?—Yes.

726. (*Mr. Williams.*) And you include the same patients over and over again?—Yes.

727. (*Mr. Wardell.*) Do the whole of the accidents at the Dinorwic quarries pass through your hands?—Yes, except a stray case now and again.

728. Practically they all come to you?—Yes.

729. How many non-fatal accidents have you on an average?—In 1890, during the latter half of the year, there were 13; in 1891 there were 10; in 1892 about 23; and in 1893, 15.

730. Was that for the whole year?—Yes, cases admitted to the hospital that were serious enough to be admitted.

731. Were they all cases that were all kept in the hospital for a week or more?—A case that is not bad enough to go to the hospital is sent home, but if a boy or man is not well enough to attend daily he is advised to stay in the hospital.

732. You have been at Llanberis for three years?—Yes.

733. Do those cases comprise those of men who have been off work for a week or more?—Yes.

734. (*Mr. Darbishire.*) Are the cases of phthisis attributable to the work, or do you know anything of the houses the men live in?—Yes, I know something of their houses.

735. In your opinion is phthisis attributable to the houses they live in, or to what?—It has absolutely nothing whatever to do with the work in my opinion. The ventilation of the houses is shocking. They very seldom open their windows, and if they open them an inch they think they have done very well. Phthisis is often due to bad nutrition. Poor diet predisposes to tubercular disease.

736. (*Chairman.*) Are the children fed in the same way as the parents?—Yes.

737. I suppose there would be very little milk used?—Yes, very little. They will not take it.

738. (*Mr. Williams.*) Then what do they do with the milk?—Make butter of it. As to butter-milk, I expect they do what I do. In winter I am compelled to give the bulk of it to pigs, because I cannot sell it. During summer and hot weather I can sell plenty of it.

739. Do you think they all do that?—I should not be at all surprised

740. You have more milk in Llanberis than in any locality I know of?—Yes, there is plenty of it. In the summer time they will take butter-milk; but they will not have it in winter.

741. Do you visit the barracks sometimes?—Yes.

742. Are they healthy?—Yes; but they are not properly kept.

743. How many live in them?—Two or three in each.

744. Are the windows made so that they will open?—Yes, but they are rarely opened.

745. (*Chairman.*) Do you see any evidence of overcrowding in the houses?—Yes, decidedly, at the men's homes.

746. (*Mr. Wardell.*) These barracks all come within the jurisdiction of the sanitary inspector and the medical officer of health?—Yes, they do.

747. (*Chairman.*) Can you tell us whether many of the houses are owned by the people that occupy them?—I should not like to be certain of that. I fancy they are; a good many of them.

748. You do not know anything specially about that?—No; except from hearsay.

749. What amount of rent do they pay; those who are only tenants?—I do not know.

750. (*Mr. Williams.*) I suppose you find the old houses are poor, and the new ones pretty fair?—Not altogether.

751. (*Mr. Wardell.*) There is no accommodation in your quarries in the way of closets?—Yes; there is.

752. How many are there?—There are about 10 or 14, but they are not used.

753. You have an ambulance corps in your quarry?—No, not now.

754. But there has been one?—Yes.

755. You have no lectures going on now?—No.

756. But you have certified men all over the quarry?—Yes.

757. Do not you consider it would be advisable to carry on the lecture, not only in the way of ambulance work, but also in the way of nursing?—Yes, I think it would be, certainly.

758. Do you find that they keep the houses clean, or is it want of ventilation that you complain of mostly?—Yes, they are very clean, but they are never ventilated.

759. (*Mr. Evans.*) What were the causes of the non-fatal accidents you have referred to?—I am afraid I cannot state now; some are broken limbs, and some are severe cuts; in fact, various causes.

760. But what produced them?—Falls of stone, the men falling, and so on.

761. (*Mr. Williams.*) Do you find any difference in appearance between the men working at the top and those working at the bottom?—No, none whatever.

762. But it is much colder, is it not, at the top than it is at the bottom?—Yes, but it makes no difference to their health.

APPENDIX III. (A).—*cont.*

SECOND DAY.

At the George Hotel, Menai Bridge, 30 June, 1893.

PRESENT :—

Mr. J. Henderson, in the Chair.	Mr. W. A. Darbishire,
Dr. C. le Neve Foster,	Mr. W. J. Williams,
Mr. F. N. Wardell,	Mr. J. J. Evans,
Hon. W. W. Vivian,	Mr. H. S. Richmond, Secretary.

William Gadlys Williams, Cefn du Quarry, and Hugh Griffith, Chwarel Fawr, were called into the room together.

William Gadlys Williams examined by the Chairman.

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763. How long have you been employed in a slate quarry?—For 30 years.

764. And how old are you now?—I am 40.

765. You must have been employed very young?—Yes, we commenced work at an early age in those days.

766. I suppose you know the nature of our inquiry?—Yes, I believe I do.

767. Have you any information you can give us bearing upon the question of the better protection of the workpeople?—I thought I might be able to offer some suggestions with regard to improvements that are desirable.

768. What do you consider the most dangerous part of the work in a quarry?—The men who work on the rock are liable to the most dangers.

769. And what suggestions would you make in respect to them?—For one thing, there ought to be a greater width in the galleries, when that is possible.

770. What would be the average width of the galleries in your quarry?—They vary from six yards or less, to 12 yards.

771. What will be the narrowest?—Those where no people work, and where the tramways are, are from two to three yards.

772. Where men are working below what would be the narrowest width of a gallery?—They vary. In our quarry the top is so loose that it sometimes comes down, and they are obliged to remove the tramway nearer to the edge of the gallery in order to pass the place that is falling.

773. That is temporarily?—Yes.

774. What would you suggest in that case as a temporary protection?—They put timber along the edge as a fence. The tops should be carried further forward than they are.

775. Do you refer to galleries in general, or only to the top where it is loose?—To the top principally.

776. And not to the intermediate galleries?—No.

777. The rocks as you descend get more solid?—Yes, when an accident does happen it is generally on account of the tops falling.

778. Have you in your own experience seen an accident arise from that cause?—I know of one case, that of a man named John Ellis.

779. How long is it since that accident occurred?—It will be two years next month.

780. Was it a serious accident?—It disabled him, to all appearance, for the rest of his lifetime as a quarryman. One arm is quite helpless, and he is now working in the weighing machine.

781. Is he the man who met with an accident and who was afterwards put to work in the weighing machine?—Yes.

782. And that accident was caused by falling stones?—Yes.

783. Are there many accidents arising from explosives?—No, there have been none since I have worked there.

784. Then from what other cause, in your experience, have accidents arisen?—Some of them have happened in consequence of the negligence of the men themselves.

785. Do you think the men would accept any special rules for their own protection against their own carelessness?—Possibly they would not be so careless if there were rules.

786. Imposing a penalty upon them for their neglect of the rules?—Yes, that would be better than meeting with an accident, and losing one's life.

787. (*Mr. W. W. Vivian.*) You have been at the quarries for 30 years?—Yes.

788. What are you, a quarryman, or rockman, or what?—A quarryman.

789. Do you work on the rock and work out?—I have been doing so, but most of my time I have been in the sheds.

790. You have been more in the sheds than out?—Yes.

791. Have you ever met with any accident during the time you have been in the quarry?—No.

792. None whatsoever?—I hurt my finger, that is all.

793. Except that you have never met with an accident?—No.

794. How many galleries have you in your quarry?—In the Chwarel Fawr there are five.

795. What is the average height of those?—They vary from 13 to 15 yards.

796. What is the angle of the high gallery?—On one side the cleavage overhangs, and on the other side it is the other way.

797. Is it perfectly perpendicular, or does it overhang?—It is something like the Dinorwic Quarry.

798. Can you not answer better than that?—If it is not likely to hold, the top is removed.

799. What is the length of the gallery where you work?—I work in the sink.

800. What is the length of it?—It is about 50 yards.

801. How many bargains are there in that 50 yards?—The bargains are all around the pit.

802. How many bargains are there all around?—Six.

803. Are there rules in existence in your quarry?—Only the Government rules, but there are some recognised rules as well.

804. You do not know of any verbal rules?—Yes, particularly in connexion with blasting.

805. Are there any other rules understood except as to blasting?—There are no rules put up except those

that are put up in accordance with the Government regulations.

806. But what are the rules that you say are understood?—As to time and others.

807. Are the rules that are printed headed "Factory Acts"?—Yes, they are.

808. Those are what you refer to as the rules?—Yes.

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809. Have you received any instructions with regard to sources of danger from any official in the quarry?—We understand each other on that point. If he sees any danger he tells us, and if we see any we inform him.

810. Have you ever been warned by the officials as to ropes at all?—Yes, we have to keep proper ropes.

HUGH GRIFFITH, examined by the Hon. W. W. Vivian.

H. Griffith.

811. What is your occupation?—I have worked on the rock for the last 20 years

812. Chiefly at the rock?—Yes, entirely.

813. Have you met with any accident at all?—No, never, except that I cut my finger once.

814. What do you suppose is the time you spend in the rock as against the time in the shed; do you go into the shed at all?—No, I have not been for years.

815. But you have been at one time during the years?—Yes, occasionally.

816. But not for the last five years, or how long—Yes, not for the last five years, since there is a shed there.

817. Then you may say your 20 years have been spent on the rock?—Yes.

818. And you have met with no accident?—No, except one slight cut of my finger.

819. What is the height of your gallery?—14 yards.

820. And what is the length?—About 50 yards. I work the slabs from the same place that William Gladys Williams works in.

821. You are working at the bottom of the quarry?—Yes.

822. And there is no one below you?—No.

823. So that it is not a gallery?—No.

824. The same rules apply to you as to Mr. Williams?—Yes.

WILLIAM GADLYS WILLIAMS, examined by Mr. Darbishire.

W. G. Williams.

825. Your reference to the dangers of the galleries refer to the top?—Yes.

826. And I understand you to say that the height of the galleries is from 13 to 15 yards?—Yes, they are of the same height except the highest.

827. What is the height of the highest?—There is a fall there, and they have carried that back. It might be 20 yards high.

828. The man who is working at the rock has to judge whether it is strong enough to work?—Yes.

829. Who is the best judge of that, the men who work there or someone else?—We who are accustomed to work there are as well able to judge as anyone. We believe that every man thinks he is doing the best for his own sake.

830. What would you do if you saw anything particularly dangerous in your gallery or in the gallery above?—Our custom is to inform the manager or the official as soon as we see him.

831. I suppose there is machinery in the shed?—Yes.

832. Have you ever had any accident from the plant or machinery?—I do not know of any accident since I have been here, and I have been there from the commencement.

833. Not only the machinery in the shed, but any machinery used in the quarries?—Yes.

834. What are they?—Cranes.

835. Do you know of any accident that has happened in connexion with those?—No.

836. (*Mr. Wardell.*) What is the custom at your quarry with regard to blasting, what time is allowed?—A steam whistle is blown to warn the men.

837. What is the first whistle?—There is only one.

838. What comes next?—It blows for us to go back to our work.

839. So that there are two whistles?—Yes.

840. And what time elapses between the first and the second?—It varies. The quarry is so small that they shout out if the blast has gone, and sometimes the whistle blows a second time in less than five minutes.

841. Then there is no fixed time for the blowing of the second whistle?—No.

842. I suppose there are men working on galleries above this sink?—Yes.

843. What is the mode you have for delivering o the powder, and how much are you allowed to have at a time?—They give it out twice a day, at nine o'clock and one o'clock.

844. And what quantity are you able to get at a time?—From 1 to 15 lbs.

845. You are not allowed to have more than 15 lbs.?—Yes, if we require it. We have to inform the official, so that he may come to see the place.

846. If you do not use the whole of the 15 lbs., or whatever quantity you get, what do you do with the remainder?—We keep it anywhere.

847. Yes, but where do you keep it?—In a tin flask, and that is put in a wooden box and locked.

848. Do you keep the powder in the weighing machine?—No.

849. Where do you retire to at blasting times; is there a shelter, or where do you go to?—In the sink where I am we go to the tunnel.

850. Is that level with the bottom of the sink that you work in?—Yes.

851. Do you think that is perfectly safe at blasting times?—It depends on us. If we go far enough into the tunnel it is quite safe, but some men have met with accidents by not going far enough in.

852. Is it through this tunnel that you go to your work?—Yes, some of them go that way.

853. How long is the tunnel?—About 600 yards.

854. Is it straight or crooked?—There are two curves in it.

855. Is it lighted up at all?—There is a light where there are points to turn the waggons.

856. Do you mean fixed lights?—There are lamps hanging on the wall?

857. Paraffin lamps?—Yes.

858. What is the distance between the waggons and the side of the tunnel; is there room for a man to pass?—There is enough space for a man to stand.

859. Is there enough space everywhere throughout the tunnel?—Yes, except where there is hard granite here and there.

860. Are there any manholes in the tunnel?—No.

861. Is it level, or is there a gradient?—Yes, there is a gradient.

862. Will a waggon go itself?—Yes, in one part of it.

863. You mean a full waggon?—Yes.

864. How are the waggons taken through this tunnel; they do not go themselves?—Men pull them or push them.

865. One man at a time?—Yes, as a rule.

866. How far do you live from your work?—Griffith and myself each live about two miles off.

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867. Suppose you get wet through on your way to your work in the morning, would you go home or commence work ?—When we get wet we are allowed to return home whenever we like. On a wet day we do not go to our work at all.

868. You can go home whenever you like if it is wet ?—Yes.

869. (*Dr. Foster.*) If you leave work do you get paid ?—It is piece-work, and we get what we earn and no more.

870. If you lose a day owing to the rain, is that day reckoned at the end of the month as a working day ? That is not counted.

871. (*Mr. Darbishire.*) Does the manager if you work four days and lose one day in consequence of the rain count that four days or five days ?—If I am at the quarry he does not deduct it.

872. But does he count it as four days or five ?—It is deducted if I am not at the quarry.

873. (*Dr. Foster.*) How near do you think the outer rail can safely be allowed to go to the edge of the rock ?—That varies. Where there are no men working underneath they may go nearer than in places where men are working below.

874. But to be safe, how near to the edge of the gallery can a tramway be ?—From two three yards if there are people working underneath.

875. But if there are people working below what is the safe distance ?—About two or three yards.

876. That would be sufficient, you think ?—Yes ; I would not be afraid to work there.

877. Do you think that one yard is the least space that should be allowed ? —Yes, it ought not to be nearer to the edge than one yard.

878. Where men are working beneath ought there to be a space of two or three yards between the outer rail of the tramroad and the edge of the rock ?—Less than that might do. If a piece of slate fell from the waggon it might fall over if there was a space of two yards, and it might not.

879. Do you think it would be a good rule to introduce into the quarries that where men are working below, the distance shall not be less than three yards ? —If it possibly could be done it would be very desirable, but there are circumstances where it cannot be done.

880. As to cases where men are not at work underneath, do you think it would be a good plan to have a rule saying that there shall either be a space of one yard or a fence ?—Life is quite safe there if there is no one working below.

881. But if a waggon went over and you fell with it, or slipped, what then ?—I do not think I have ever seen an accident of that kind.

882. Do you think, in spite of that, it would be a good thing to have a space of a yard or a fence ?—If circumstances allowed, it would be desirable.

883. It would be better, where practicable, to have an interval of one yard between the outer rail of the tramway and the edge of the rock, or to have a fence ? Yes.

884. (*Chairman.*) Would you object to a fence in cases where men are employed below ?—No, certainly not.

885. You would prefer a fence ?—Yes.

886. What do you mean by a fence ?—Pieces of timber or strong slate laid horizontally.

887. You would prefer any kind of a fence rather than be without one ?—Yes

888. What food do quarrymen generally eat ?—They all eat pretty much the same.

889. But what do they eat ?—I can say what my own food is.

890. Well, what is it ?—Tea in the morning, with an egg and bread and butter.

891. Is it white bread that you eat ?—Yes, and sometimes oat cake and sometimes brown bread.

892. What time do you take that meal ?—Before going to the quarry.

893. What meal do you take next ?—A dinner in a way, and that is tea.

894. And what do you get with the tea ?—Bread and butter.

895. When is the tea you have at dinner made ?—We have the tea and sugar mixed together in a small can, which we bring with us from home in the morning, and we boil the water in the quarry.

896. What time of the day do you put the water on the tea ?—We use it at once, as soon as we make it, as a rule.

897. How is it otherwise ?—The water is boiled at dinner-time, and I put the tea and sugar in the water, and I also have milk. I drink it as soon as it gets cool.

898. And that is between 12 and 1 o'clock ?—Yes, at 12 o'clock.

898A. What is your next meal ?—As a rule we have a piece of bread and butter left after dinner, and we take that about 4 o'clock. We take that where we happen to be working.

899. Do you take tea with that ?—No.

900. Do you take anything to drink with it ?—No, nothing.

901. What is the next meal that you get ?—We get nothing until we go home.

902. And what do you get then ?—I get potatoes as a rule all the year round, and some meat.

903. What meat do you get ?—Sometimes beef, and at other times bacon.

904. Do you get tea then ?—No.

905. What do you drink ?—Buttermilk.

906. Then that is your ordinary diet for every working day ?—Yes.

907. What time do you have the last evening meal ? —Sometimes we have a meal after the one that we take after getting back from our work.

908. What time do you take the first meal after reaching home from your work ?—From 6 to 6.30.

909. Do you get anything after that ?—Sometimes we do, if we want it.

910. What do you get then ?—Porridge sometimes, and at other times I only drink half a pint of buttermilk, or a cup of coffee.

911. What time do you take that ?—Between 9 and 10.

912. And what time do you go to bed ?—About 10 o'clock, after that meal.

H. Griffith.

HUGH GRIFFITH, by the Chairman :

913. Is your diet the same as the diet of Williams ? —Yes.

914. Is that a fair sample of the diet of a quarryman ?—Yes, amongst the best class of them ; those that take most care of themselves.

915. You are both married ?—Yes.

916. On Sunday what do you get ?—We get a better dinner on Sunday ; potatoes and meat and some kind of tart.

917. That is in the middle of the day ?—Yes.

918. Have you any barracks at your quarry ?—Only one barracks, and two men remaining in them.

919. Have you any eating-house for your dinner in the middle of the day ?—We have a kind of a cabin where I am, and a stove in it.

920. Is it a comfortable place ?—It is not very comfortable in all states of the weather.

921. Would it be a good plan in your opinion to have a place where you could change your clothes on going to the quarry if they are wet, and have a suit that you could use to work in and leave them at the quarry, and go home in your dry clothes ?—Yes, it would be a very good plan if circumstances would allow it.

922. What do you mean by circumstances allowing it?—We should want more wages to buy the clothes.

923. What is your average wage?—If we work a full month it is from 5*l.* to 5*l.* 10*s.*

924. That is for 24 days?—Yes, but 23 days is our full month, as we have one day off every month.

925. Does the house you live in belong to you?—Yes. *H. Griffith* 30 June 1893.

926. How many rooms are there in it?—There are three and a small pantry downstairs, and four upstairs.

927. Is it a freehold house?—Yes.

WILLIAM GADLYS WILLIAMS, by the Chairman: *W. G. Williams.*

928. Do you live in your own house?—No.

929. What is the size of your house?—It is a small tenement, with sufficient land to keep a cow. There are two rooms on the ground floor, and those above have very little head-room.

930. How many rooms have you upstairs?—It was only one originally, but we have made it into three.

931. What rent do you pay?—I pay 11*l.* 10*s.* a year and the rates come to about 25*s.* a year.

932. But you have some land as well as house?—Yes.

933. What is the extent of the land?—It is not quite three acres.

WILLIAM GADLYS WILLIAMS, by Mr. Williams.

934. Are there many like you who hold small tenements in your district?—Yes, the majority do so.

935. Do they pay similar rent to yours, or are they their own holdings?—The majority of them pay a high rent.

936. You say you keep a cow?—Yes.

937. Is it of any benefit to you?—We cannot say for a certainty, as we do not keep an accurate account of the cost.

938. You get butter and milk from the cow?—Yes.

939. And what use do you make of it?—I use it in the family. I have several children.

940. You also get buttermilk?—Yes.

941 And do you use that for the family, or do you give it to the pigs?—As a rule the family get most of it.

942. How many have you in the family?—There are seven in all, but my father and brother live with me.

943. You said just now that you had made three rooms out of the room upstairs?—Yes.

944. How large are those rooms?—They vary from 3 yards square to 2 yards square. One, is 3 yards by 3, and the other two are 2 yards by 2.

945. What is the height of the rooms upstairs?—They are only 2 feet high in the lowest part.

946. And how much in the highest?—Perhaps 6 feet.

947. You have a bed in each of those three rooms?—No, only in two of them.

948. How many are there sleeping in those beds as a rule?—Two in each.

949. Where do you get a light into the rooms?—There are windows in the wall.

950. Are the windows in the front or back or at the end of the house?—They are in the front.

951. Do those windows open?—Yes.

952. Is there a chimney there?—Yes, at one end of the house.

953. You said just now that you have not worked much in the quarry on the rock; you have been working in the shed mostly?—Yes.

954. What are the dimensions of the shed that you work in?—It is 80 yards by 15 yards.

955. And how many tables are there?—Twenty-one I think.

956. How many men are there working at each table?—One man at present.

957. Have you doors at both sides of the shed?—Yes.

958. Are they generally closed or open whilst you are at work?—They are generally open.

959. How do you get light into the place?—There is glass in the roof above our heads.

960. Are they skylights that open?—No.

961. Are there any other means of ventilation besides the doors?—Yes, there are eight ventilators at the top of the building.

962. Have you much dust there?—Yes.

963. Is there enough draught to clear away that dust, or do you feel it sometimes rather suffocating?—Yes, we do at times. There is not enough air passing through the building.

964. Do the saws on the tables turn in water, or how?—Yes, they turn in water.

965. Do you consider that there is more dust in that method of working than in the old method of working in the walls?—Yes.

966. Do you think that that affects you as workmen at all?—Yes, we think it does.

967. From the point of view of health?—Yes.

968. More than under the old system?—Yes.

969. How long have you worked in that shed?—For six years.

970. How do you think it affects your health—By inhaling it.

971. Where does this dust come from?—From the saws and from dressing.

972. Although the saws turn in water?—Yes.

973. (*Chairman.*) You say the saws turn in water?—Yes, but that does not do away with the dust if the slate is hard.

974. Do you say that the dust come from the saw although the saw turns in water?—Yes.

975. (*Hon. W. W. Vivian.*) When the saw comes up from the water does it come up wet or dry?—Wet.

976. (*Mr. Williams.*) What is the object of having the saw turning in water?—There are two objects.

977. What are they?—One is to prevent the slates from drying too much, and the other is to keep the saw cool.

978. Is there much dust coming from the dressing of the slates?—Yes.

979. More than from the sawing?—Yes, there is.

980. And you say it affects your health?—Yes.

981. In what respect does it affect you?—I have only the testimony of two medical men whom I have consulted from time to time.

982. What are their names?—Dr. Lloyd Williams, of Llanberis, and Dr. Hughes, of Waenfawr.

983. Why did you go to see the doctor?—I had pluerisy and my stomach was out of order.

984. And what did the doctor tell you?—He asked me if I spat out dust in the morning, and I told him I did.

985. How do you know it was dust?—Because I knew it could not be anything else.

986. (*Chairman.*) Were you unable to work at that time?—At times I was too poorly to work.

987. (*Mr. Williams.*) How did you detect that it was slate dust and not something else?—I knew by its colour.

988. Was it the same colour as the slate upon which you were working?—Yes, almost exactly the same.

989. What did the doctor say to you further?—He said it was very unhealthy, but he did not explain to me in what respect it was so.

990. Which of the two doctors was that?—Both doctors told me the same thing.

991. Did the doctors tell you that the reason why you were poorly was because you inhaled this slate dust?—He said the place I worked at did not agree with me.

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992. Did he suggest any method to you by which you could avoid inhaling the dust?—He suggested better ventilation.

993. (*Chairman.*) Had the doctor seen the shed at all?—Yes, I remember seeing him there once, and I spoke to him then.

994. Which doctor was that?—Dr. Lloyd Williams, and he said at the time that the place was unhealthy.

995. How long ago is that?—Perhaps about two years ago.

996. (*Mr. Darbishire.*) Did you ever speak to the manager about the matter?—Yes, and it was after speaking to the manager that we got what we did.

997. (*Mr. Williams.*) What is it that you have had?—The eight ventilators at the top of the building.

998. There were no ventilators when the shed was built originally?—No.

999. (*Chairman.*) Has there been any improvement since the ventilators were put there?—Yes, a little, but we do not feel that it is enough.

1000. Are respirators worn at all by men in your district?—No, I have never seen any.

1001. (*Dr. Foster.*) Did the doctor suggest to you that you should use the respirator that nature has given you, and breathe through the nose and not through the mouth?—No, he did not. We cannot on every occasion breathe through the nose. I would like to say something more about the doors.

1002. (*Mr. Williams.*) What have you to say about them?—We feel that the doors are not fairly divided.

1003. What do you mean by that?—The door cannot be shifted in order to protect me from receiving injury from the next door.

1004. What injury do you receive?—There is a draught.

1005. Do you perspire in working?—Yes, we do.

1006. And you feel the draught?—Yes.

1007. But you do not perspire in winter, do you?—Not so much, of course.

1008. (*Dr. Foster.*) When do you perspire most, in winter or summer?—In summer.

1009. Are you sure of that?—Yes, it seems to me that that is so.

1010. How do you know?—Because I feel it.

1011. And you feel the effect of the draught more in winter than in summer?—We consider that we are in most danger when we are perspiring.

1012. (*Chairman.*) Do you wear flanneis?—Yes.

1013. Both in summer and winter?—Yes, but I put on lighter flannels in summer.

1014. But you do wear flannels in the summer as well?—Yes.

1015. (*Mr. Williams.*) How often do you change your flannel?—Every week.

1016. And oftener if you get wet?—Yes.

1017. How many men are there working in the Cefn Du Quarry?—The number varies from 170 to 190.

1018. How many of those work inside the quarry on the rock, and outside?—I am not quite sure of the figures, but they are as near as I can get them. There are 60 quarrymen who work outside, and boys in addition.

1019. And the other 90 inside?—There are 80 labourers and rockmen, and about 20 blacksmiths, joiners, drivers, fitters, and loaders, and the remainder, whatever it is, are small boys.

1020. Do the boys work in on the rock, or do they work out?—They go into the quarry to gather their blocks.

1021. (*Mr. Evans.*) In the course of your experience have you seen many accidents from explosives?—I have not seen one in the quarry where I am working now.

1022. Have you seen any at other quarries?—Yes, several.

1023. In what quarries?—It was at the Dinorwic Quarry I saw the first.

1024. Where did you see the others?—At the Glynrhonwy Quarry.

1025. How did those happen?—As a rule by putting the powder in the crevice or at the end of the rock.

1026. How did the fire get to the powder in that case?—Generally the men when they put the powder in the crevice were not careful enough to scatter it properly.

1027. Did you see any explosion take place in tamping?—I do not remember now.

1028. Did you see any take place in unramming them?—Yes.

1029. Have you seen many of that kind?—Yes, several from time to time, if I could only remember the particulars.

1030. Have you seen accidents happening in consequence of men going to them too soon?—Yes.

1031. Have you seen any taking place in consequence of re-powdering too soon?—Yes.

1032. Do you consider those an important branch of accidents at the quarries?—Yes, they are most serious.

1033. Were any of those cases fatal?—Yes.

1034. Were many of them fatal?—The majority that I have seen were fatal.

1035. Have you known of any cases where men have lost their eyesight and not lost their lives?—Yes.

1036. (*Chairman.*) Did those accidents happen to your own personal knowledge?—Yes.

1037. And were you working at the Dinowwic Quarry at the time?—Yes.

1038. (*Mr. Evans.*) Have you any remedy on this point to suggest to the Committee?—We ourselves have called the attention of each other to the matter, and things have materially improved since then. Other quarries have made local rules, and I believe if the Committee suggested further rules they might be effectual in preventing these accidents.

1039. Have you any suggestions to make yourself on the matter?—There ought to be provision for the burying of the powder.

1040. What do you mean by burying the powder?—To cover it over with soil.

1041. Who do you say should compel that to be done?—The reason of every man of experience ought to lead him to do it.

1042. (*Chairman.*) Would you suggest the framing of a rule compelling every man to do it under a penalty?—Yes. As a rule it is inexperienced men that meet with these accidents.

1043. (*Mr. Evans.*) Do you say that these accidents always happen to inexperienced men?—No, not always, but it is so as a rule.

1044. In regard to blasting time, do you consider that the same rule about blasting would suit every quarry?—No, it would not.

1045. Then you would recommend that every quarry should make rules in regard to blasting to suit its own requirements?—I think the same rule might apply to all, but the intervals ought not to be the same in the large quarries as in the small ones.

1046. Do you think that small quarries ought not to blast as often as large quarries?—Yes, I think they should.

1047. Would you propose that these local regulations should be subject to the approval of the inspector?—Yes.

1048. Have you shelters at the galleries in your quarry?—Yes, but they are not sufficient.

1049. You think they should be increased and improved?—Yes, they should.

1050. Do you consider there should be more than one place of shelter where there is blasting going on above?—Yes, if there are too many men.

1051. But do you think the men ought to have more than one place to go to if there is blasting going on above?—Yes, I do.

1052. Then you think there ought to be more shelters than one?—Yes, in many quarries that I know of they take for granted that this tunnel is quite sufficient. I consider that this is quite wrong if the

tunnel is wet. It will do well for protection from blasting, but not as a shelter in wet weather.

1053. Do you recommend, where tunnels are used as shelters, that there should be a little wall at the side of the tunnel to protect the men from loose pieces of slate?—Yes.

1054. Do you know of accidents that have taken place in tunnels in consequence of pieces of slate flying about?—Yes.

1055. With regard to tramways, do you say that the outer rail may be less than three yards from the side of the gallery? Do you say it should be less than two yards where men are working underneath?—No.

1056. It should not be less than two yards in any case?—No. The gradient of the tramway at that particular place ought to be taken into account in considering what the space should be.

1057. (*Chairman.*) In your opinion, do you think that two yards should be the minimum distance?—I cannot be quite sure about that.

1058. (*Mr. Evans.*) Where two yards cannot be got would you be satisfied with a fence?—Yes.

1059. You do not think that the tops of galleries should of necessity be kept at any slope?—They should be kept back.

1060. How far back do you think they ought to be kept?—I cannot say for certain. There are so many things in the rock that it is almost impossible to answer the question definitely.

1061. Who would you give that duty to?—To the manager.

1062. Do you consider that you are responsible for keeping your bargain from loose stones after you take it at the commencement of the month?—Yes.

1063. Do you consider that a greater slope is required in a long gallery, say of 50 or 100 yards, than in a short one?—Yes, certainly.

1064. Can you give any reason for that answer so that the Committee may see what is your view of the matter?—Because the weight on the top is more likely to make it loose.

1065. Do you sometimes see two joints which meet and make a loose end in the rock?—Yes.

1066. Do you consider that an important point in slate quarrying?—Yes, I do.

1067. Do the officials at your quarry object to your using bad ropes?—Yes.

1068. Do you think it requires a practical knowledge to judge what the width of the galleries should be, to meet the case of different rocks?—Yes.

1069. Do you consider that to be an important question in regard to all who look after quarries?—Yes, it is a very important matter.

1070. You have no chains or anything of that kind in your quarry?—There is one.

1071. In throwing down rock where there are galleries below, do you consider that notice should be given to the men working in the galleries below before any rock is thrown down?—Yes, certainly. That is always done in our quarry.

1072. Do you think that the man who throws down should be allowed to do so before he is certain that all the men down below have cleared out of the way?—No, he should not be allowed to do so.

1073. (*Chairman.*) How do you propose that that should be prevented?—It ought to be understood among the men, and the man ought to be certain that the place is clear before he throws anything down.

1074. (*Mr. Evans.*) Do you think that a man who may be stopped from throwing down should report to the manager if the men below refuse to get out of the way?—Yes, he ought.

1075. You consider that that would be the only practical way of carrying out the object in view?—Yes.

1076. And if the man at the top throws anything down without giving proper notice, do you think the men down below should report him to the manager?—Yes.

1077. (*Chairman.*) Would you propose that a penalty should be imposed upon any workman who throws down stones without giving notice to the men below?—Yes, certainly.

1078. (*Mr. Evans.*) In your quarry there are some portions left untouched and not in the care of any workman?—Yes.

1079. Do you think these places should be examined now and then before the men are allowed to work below them?—Yes, they should.

1080. By whom do you think they should be examined?—By the manager, and if he chooses he could take another man with him.

1081. I suppose the manager would have to employ some workman to do this who understands the work?—Yes.

1082. Would you say that these examinations should take place periodically?—Yes.

1083. Would you make a difference between summer and winter?—They ought to be examined after long-continued frost or drought.

1084. That would be an occasional thing?—Yes.

1085. Would you make it a rule to examine them regularly apart from changes in the weather?—Yes.

1086. You advocate periodical examinations?—Yes. There is an example of the importance of that in the case of John Ellis.

1087. How did he meet with his accident?—He was working in the summer at a place that was bent down. Nobody was working there at the time, and a piece of stone fell down and broke his arm, but I am told John Ellis was warned by the manager of his danger.

1088. Do you think that the result of these examinations should be entered in a book to be kept at the quarry?—Yes, the work would be more likely to be done if a record were kept.

1089. Do you consider that the minute management which exists at the Cefn Du Quarry has assisted in keeping down the number of accidents?—Yes, I fully believe that.

1090. How do you enter the pits, by tunnels, or ladders, or footpaths?—Through the tunnel and by ladders.

1091. Have you long ladders?—No, they are not very long.

1092.—How long are they?—There are three ladders to cover a distance of 14 yards.

1093. The depth you have to descend is 14 yards?—Yes.

1094. Do you think it is important to look after the ladders in the quarry?—Yes.

1095. I suppose it is your experience that they are sometimes struck by lumps from blasting, and so on?—Yes.

1096. Are they fixed perpendicularly or at a certain angle?—They vary.

1097. Do you think that they should be overhanging at all?—No, they ought not.

1098. Are they ever fixed in that position?—I have never seen them so yonder.

1099. (*Dr. Foster.*) What are those ladders made of?—Iron.

1100. Iron sides and iron rungs?—Yes, all iron.

1101. (*Mr Evans.*) You have no shafts in the quarry?—No.

1102. Are there cranes in the quarry?—No.

1103. Is it possible that they go under another name?—No.

1104. Have you a winch at the quarry?—No.

1105. Have you what they call a Samson?—Yes.

1106. Do you consider that any rules that may be framed ought to be put up at the quarries in Welsh as well as in English?—Yes, certainly.

1107. (*Chairman.*) Are your factory rules put up in Welsh?—They are, in the weighing machine, and there is one copy in English.

1108. (*Mr. Richmond.*) It is understood that during blasting all the men are to go into the shelters provided for them?—Yes.

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1109. Do the men always observe that rule?—No, not always.

1110. It is also understood that you use your ropes when working on the rock?—Yes.

1112. And do the men observe that rule?—Not always.

1113. (*Chairman.*) Would you consider it reasonable that a penalty should be imposed on any man who refuses to attend to those rules?—Yes.

1114. (*Mr. W. W. Vivian.*) You say that there are 60 in the shed working in, and 80 in the quarry, and 20 joiners, and so on, and the remainder boys?—Yes.

1115. How did you get those figures?—I counted them myself.

1116. How many times did you count them?—I have the account as they are generally.

1117. But for how many days did you count them?—We have not completed counting. We intend to count for a month.

1118. For how many days have you counted them for this Committee?—Only one day.

1119. What time of the month was it, the commencement, or the middle, or the end?—It was the day before yesterday.

1120. When did your month commence?—About a fortnight ago.

1121. When were you working at Dinorwic?—I have been there twice. I commenced to work there first of all.

1122. When were you there?—30 years ago.

1123. Was that the last time you were there?—No, that was the first time.

1124. When did you leave there the last time?—Between 20 and 21 years ago.

1125. Are there no overlookers at your quarry as well as a local manager?—Only the manager.

1126. There are no overlookers?—No.

1127. Who is the manager?—Thomas Owen Jones.

1128. He is next to Mr. Menzies?—Yes.

1129. And who is next to Thomas Owen Jones?—No one.

1130. Have you a slate-counter?—No.

1131. Who takes the count of the slates?—The loaders, when they put them into the waggons.

1132. You have no time-keepers?—No.

1133. Is there a clerk?—There are two partly.

1134. What do they do; they go into the quarry to look after things?—They do not take any responsibility upon themselves. They keep the books and accounts.

1135. How many drivers and tip-men are there?—There are five drivers.

1136. How many of them are constantly in the quarry?—There are three in.

1137. Inside the quarries?—Yes.

1138. And how many tip-men are there?—About six.

1139. (*Dr. Foster.*) Is the middle of the month a fair average to take of the number of men in and out?—Yes, it is the best time to get an average.

1140. Then you think it is a fair average?—Yes.

1141. Have you anything else to state to the Committee?—Where I am working there is a stable with only a wooden partition between it, and a strong smell comes from the stable.

1142. (*Mr. Evans.*) Have you seen lumps of slate falling from waggons as they pass along the tramways?—Yes.

1143. And I suppose that takes place very often?—It might. Some care is taken to prevent this.

1144. Do you think it would be practicable to give warning to the men below before the waggon is allowed to pass above them?—I am afraid it would not. It might be a great loss to the men if they were obliged to move every time a waggon passed.

1145. And it would be a great labour for them to go up and down the rock?—Yes, it would.

1146. (*Dr. Foster.*) Is there any rule in the quarry to prevent the overloading of these waggons?—Yes, there is.

1147. (*Mr. W. W. Vivian.*) What do your weighing machines weigh?—They vary. One weighs 35 cwt., and those on the level take 2½ tons.

1148. A load of 2½ tons is pretty high on the waggon, I suppose?—Yes, but it depends on the size of the waggon. Our waggons as a rule are pretty large.

1149. But generally, are they above the sides of the waggons?—Yes, some inches.

1150. The accident you have referred to as having taken place at Dinorwic occurred more than 21 years ago?—Yes.

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THOMAS HUGH GRIFFITH, of Penyrorsedd Quarry, examined by the Chairman.

1151. How long have you been employed in slate quarries?—Since I was seven or eight years of age.

1152. How old are you now?—Fifty-eight years.

1153. Have you always worked in the same quarry?—Yes, except the first year.

1154. With that exception you have always worked in the Penyrorsedd Quarry?—Yes.

1155. Have you any suggestions to make as to the prevention of accidents in quarries?—I have not prepared anything in particular, but I am ready to answer any questions that may be put to me.

1156. (*Mr. Darbishire.*) Have you seen many accidents in the quarry?—Yes, a great many.

1157. (*Chairman.*) From what causes did those accidents chiefly arise?—They varied.

1158. Have you seen many accidents from explosives?—Yes, several during that time.

1159. How did they arise?—I have to depend entirely upon my memory, and perhaps it would be better for me to confine myself to the last 10 or 12 years.

1160. Then you had better do so.—During that time I only remember one fatal accident from explosives.

1161. Do you know the cause of that accident?—It was the case of a man named John Jones, of Gorlan. He was re-charging a hole, and the first shot had made a crevice in the rock. He was putting powder in a second time, and the powder went into the crevice and after stamping it, part of the powder got outside the hole, and as he was igniting the fuse the head of the match fell upon the powder in the crevice and it exploded.

1162. Do you consider that that was the result of carelessness on the part of the man?—Yes, entirely.

1163. Have you seen many accidents from falls of stone?—Yes, I have seen some.

1164. Have you any suggestions to make for the better protection of the men in regard to that?—Some of those accidents that have occurred were at the top of the quarry, and were owing to the men going too far underneath the earth, which fell sooner than they expected.

1165. Can you offer any suggestion for the prevention of that?—The direct way would be not to undermine it.

1166. But why do you undermine it if it is dangerous?—Because it is easier to get the top off if it is undermined.

1167. Are they controlled in that respect by the manager?—Yes.

1168. Has the manager of the quarry the right to interfere when he finds the men working in a dangerous manner?—They do caution us when they think we are going further than they consider is safe.

1169. And do you pay attention to that caution?—Yes, as a rule.

1170. Have you been working principally inside the quarry?—I have been working on the rock for the last 12 years.

1171. So you are a rockman?—Yes.

1172. Is the quarry at which you are working worked on the gallery system?—Yes, partly.

1173. And have they tramways there?—Yes.

1174. What is your opinion as to the space necessary between the outer edge of the tramway and the edge of the gallery?—When a waggon is passing a place where they do not work underneath a smaller space would do than otherwise.

1175. What distance would you suggest where no one is working underneath?—From 1 to 2 yards.

1176. Is it a rule when men are working underneath that they should be warned of the approach of a waggon?—Yes, if it is considered that the load on the waggon is dangerous.

1177. And who is the judge of that?—The man who is in charge of the waggon.

1178. Are you of opinion that the men working below should have notice in all cases where a waggon passes?—It would certainly be safer, but there is no doubt that in many instances there is no danger at all.

1179. And it would cause inconvenience to the men working down below to have to shift about continually?—Yes.

1180. You have had no experience of accidents through machinery?—I do not know of any fatal accident of that kind to our workmen, but I remember one boy who was not working at the quarry.

1181. And how did that accident happen?—I was not at the shed at the time, but I heard that he got in contact with the strap, and there was no time for any one to get him loose.

1182. How long ago is that?—About three or four years ago.

1183. (*Mr. W. W. Vivian.*) What is your occupation at the quarry?—I am working on the rock.

1184. And you have been there about 50 years?—Yes.

1185. Have you ever met with any accident?—No, nothing serious. I never broke a bone.

1186. (*Mr. Darbishire.*) Do you consider that the Penyrorsedd Quarry is more dangerous than quarries in general?—Yes, I do, on account of the nature of the rock. The rock is more loose.

1187. Is the health of the men at Penyrorsedd good or bad?—It is as good as quarries in general, if not a little better. We have more advantages than other quarrymen.

1188. (*Mr. Wardell.*) How many men are there working in your quarry?—About 450.

1189. What is the system followed there with regard to the giving out of powder?—We get it once a day as a rule, but occasionally we may get it oftener.

1190. And how much do you get at a time?—We get as much as we consider necessary for the day.

1191. Do you use much powder there?—Some parts use more than others.

1192. Is any other explosive used besides powder?—Yes.

1193. What is it?—We sometimes use gelatine.

1194. What do you do with the powder that is not used?—We have a place aside to keep it in a cask.

1195. Is it locked up?—No, not as a rule, but some do so.

1196. Where do you go to for shelter when blasting takes place?—To the tunnels.

1197. Then there is no other place of shelter except the tunnels?—No, not at present, but there was when the tunnels were not convenient.

1198. Are there tunnels on every gallery?—Yes.

1199. Are those tunnels straight or crooked?—They are not always straight.

1200. Is it through those tunnels that you go and come to your work?—Yes.

1201. Are they wide enough to enable you to pass a waggon if one happens to meet you?—There are several places where we may pass a waggon.

1202. The rubbish is drawn by locomotives?—Yes. *T. H. Griffith.* 30 June 1893.

1203. Are the tunnels lit up?—There are openings in many of them.

1204. So that the tunnels are lit from these openings?—Yes.

1205. There are no lamps there?—No, there is no necessity for them.

1206. How many horns or whistles are blown at the time of blasting?—A horn is blown.

1207. When is it blown first?—It blows three minutes before blasting.

1208. And when is it blown next?—The second is at the end of three minutes, for them to ignite.

1209. And what else?—There is another seven minutes before we return to our work.

1210 And how often do you blast?—Every hour.

1211. And it takes you 10 minutes each time?—Yes, according to the horn, but we do not always follow that, unless we know there is a dangerous place.

1212. But you do not return to your work, do you, until the last horn has been blown?—Sometimes they have a longer period than that, when we have a large blast

1213. But do you in any case return to your work before the third horn has blown, in seven minutes afterwards?—No.

1214. You never do so?—No, when we have gone to the tunnel, but sometimes we do not go when we think there is no danger.

1215. But that is contrary to the rules, is it not?—Yes.

1216. As you do not keep the rules which already exist do you think there is any use in making any new rules?—We consider that we do not do any harm to anybody when we break that rule.

1217. Would it lead to the enforcement of that rule if a penalty were inflicted for its non observance?—It would certainly be a safeguard.

1218. Has any man ever been fined in your quarry since you have been there?—I am not certain whether any one has been fined, but a great many have been cautioned.

1219. Do you know of any accident in consequence of the men not going into the shelter after they have been warned?—I think I know of one.

1220. (*Dr. Foster.*) Have you suffered in health at all from working at the quarry?—I cannot say that I have. I have never been under the care of a medical man.

1221. Do you live in barracks or in your own house?—In my own house.

1222. Does the house belong to you?—Yes.

1223. Is it a freehold house?—Yes.

1224. What is the size of the house?—It is too large for me.

1225. Have you any eating room for your dinner at the quarry?—Yes.

1226. And is it a comfortable one?—Yes, and there is a man there who is paid for boiling our water and preparing things for us.

1227. What food do you take?—In the morning before starting for the quarry I have tea or coffee with bread and butter.

1228. Do you get anything else?—No, not as a rule.

1229. Is it white bread or brown?—White bread, and sometimes we have oat cake.

1230. You get your dinner at the quarry?—Yes.

1231. What do you get then?—Tea, as a rule.

1232. And what do you get with it?—The same as in the morning.

1233. When do you get that?—At 11.30.

1234. Do you eat anything more until after 5.30?—Yes, at the quarry, but there is no proper time for it.

1235. When do you get that?—From 3.0 to 3.30.

1236. And what do you get then?—Bread and butter.

1237. And tea?—No, not always.

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1238. Then what do you get?—Only bread and butter.

1239. Where do you take that food?—At our work.

1240. Is there any milk and sugar in the tea?—Yes.

1241. You mix that in at dinner time?—Yes, the man who looks after the place mixes them altogether.

1242. What do you get after you reach home?—Potatoes all the year round, and meat.

1243. What kind of meat do you get?—Sometimes bacon, and sometimes mutton or beef.

1244. Do you ever get pork?—Yes.

1245. Do you keep a pig yourself?—No, I buy the bacon.

1246. What time do you get the meal that you get after reaching home?—Between 6.30 and 7.

1247. Do you get anything else that night?—Yes, as a rule.

1248. What do you get?—A cup of tea or coffee.

1249. And what do you get with it?—The same as in the morning.

1250. Bread and butter?—Yes.

1251. Do you drink buttermilk?—Yes.

1252. And how do you live on Sunday?—We live a little better on Sundays.

1253. What is the difference?—We have fresh meat every Sunday.

1254. (*Mr. Williams.*) You have been working all your life time, except 12 months, at Penyrorsedd?—Yes.

1255. You are working in galleries?—Yes.

1256. How do they raise the rubbish and the blocks from the sink?—With engines from the top in some cases, and in others it passes through the tunnel.

1257. Do they work with those engines by chains or on an incline?—By chains.

1258. Do you think they could be worked without chains, by bringing the material to a certain place and lifting it up perpendicularly?—One part of the quarry was worked in that manner by raising it through a shaft.

1259. Is it possible now, do you think?—I think it is possible, but I do not know whether it would be so convenient for the workmen in all cases.

1260. If they did that they would have to lay rails down to run the waggons up to a certain point?—Yes.

1261. Which do you consider the safer, the present mode or the mode you say was adopted formerly?—Of course it is safer to wind them perpendicularly, but the present mode is more advantageous to the workman than the other.

1262. How is it more advantageous to the workman than the other?—Because you can get a waggon to a certain place with the present arrangement, whilst you could not get it by the other mode.

1263. You could get a waggon anywhere with a chain?—Yes.

1264. And it would save you the trouble of getting the rubbish from one place to another?—Yes, in some cases it would.

1265. You say that the top is very large, and that underneath it is loose, so that it is more dangerous than other quarries?—Yes.

1266. Are there many accidents in the Nantlle Quarries?—Yes, a great many.

1267. Are there more accidents in the Penyrorsedd Quarry than in the other quarries, or not?—I think there are less in proportion to the number of men employed.

1268. There is a great deal of gravel at your quarry, and the slate rock, you say, is loose underneath?—Yes.

1269. Do you know of your own knowledge what number of accidents have occurred at the Penyrorsedd Quarry?—No, I cannot say from my own knowledge.

1270. Can you tell us approximately how many men there are working on the rocks, as you are, and how many are working out?—There are 163 working in the quarry, and 287 outside.

1271. Are there many of these men who go backwards and forwards, working part of the month in and part of the month out?—Yes, on some occasions.

1272. But as a rule they keep to the same place, either in or out?—Yes, as a rule.

1273. How have you arrived at those figures?—By counting them in the quarry.

1274. When did you count them?—This week.

1275. How many days have you been counting?—Only for one day.

1276. Is that a fair average, do you think?—I think it is a fair figure.

1277. What part of the quarry month was it that you took the figures?—The last week of the month.

1278. Can you tell us the height of your galleries?—I think they are from 18 to 21 yards.

1279. And can you give us the average width of the galleries?—They vary.

1280. What is the larges and smallest width?—I cannot say exactly.

1281. But tell us as near as you can?—There are some from 6 to 8 yards wide.

1282. Are there some very narrow?—There are some narrower than that.

1283. Do you think it would be advisable for them to be wider if possible?—I cannot point at present to anything that has taken place in consequence of their being the width they are.

1284. Suppose a man went to throw anything down there, would he be obliged to warn the men in the gallery below?—Yes.

1285. Why would he have to do that?—It is possible that slates might fall over into the next gallery.

1286. In order to be safe what width do you think the gallery ought to be, if it is from 18 to 21 yards high?—It depends what quantity of rock is coming down.

1287. But take the ordinary way of working, what width is necessary in your opinion?—I should not like to throw a large piece of rock down whatever is the width without giving notice to those below, even if it were much wider than the present width.

1288. Then, as a rule, you do give notice to those below before throwing anything down?—Yes, we do.

1289. Is that a rule in the quarry?—Yes, and it is always done.

1290. Suppose it is raining in the morning, and you get wet through, would you work in your wet clothes all day long?—No, we are allowed to dry our clothes in the place where we get our dinner.

1291. How do you dry them?—We take them off.

1292. How would you do with your trousers?—We do not work to get so wet as that.

1293. When it is very wet you can go and shelter?—Yes.

1294. And you are allowed to do it by the manager?—Yes, nobody ever objects to our doing so.

1295. And when you see that there is no chance of its getting fine you go home?—Yes, after it gets far into the day.

1296. (*Chairman.*) Do you ask permission to go home under those circumstances?—No, not if it is unfit to work.

1297. (*Mr. Williams.*) Have you a small tenement as well as a house?—Yes.

1298. The house is freehold?—Yes.

1299. Do you keep a cow?—Yes.

1300. Have you more than one?—Yes, I keep two.

1301. You get milk and butter?—Yes.

1302. What use do you make of it?—We use it in the family, and if there is any to spare we sell it.

1303. Is there a market for it?—There are plenty of shopkeepers close by who take it.

1304. The people do drink buttermilk as a rule, and are glad to get it?—Yes.

1305. Do you think the quarryment drink more tea now than they did formerly?—Yes, they do; a great deal.

1306. What is your opinion as to the men; do you think that they are stronger or weaker than formerly?

—I think the men I first remember were stronger than the men of the present day.

1307. And they used plainer food than they do now?—Yes, years ago they did.

1308. (*Mr. Evans.*) You say that during the last ten years there were 10 fatal accidents?—Yes.

1309. But Mr. Darbishire says there were 12?—Very likely, but I can only remember 10 myself.

1310. Will you tell us how those accidents took place?—The first was through the explosion that I have referred to.

1311. Which was the next accident?—It happened to a man in a tunnel, through pulling down the props of wood, and the rock fell down upon him.

1312. What was the next?—Part of a bargain fell down and killed a man who was working there.

1313. And what was the next?—A man was killed through the chain getting loose.

1314. Do you find that accidents happen very often through chains becoming loose?—No, that is the only one I know of.

1315. (*Chairman.*) Do accidents happen frequently in that manner in your quarry?—No, that is the only one I remember.

1316. (*Mr. Evans.*) How was that chain fastened?—I believe there was a hole in the rock, and they put a wedge there and fastened it.

1317. That is the general way of fastening them, I believe?—Yes.

1318. What are the other accidents?—One accident happened to a man named Henry Pritchard. He was working at the top.

1319. How did that happen?—Part of the gravel that he was digging under fell upon him.

1320. What was the next accident?—The next was a similar case. It happened to a man named Henry Griffith, and in the same place, too.

1321. What was the next?—A man was working in his own bargain without a rope.

1322. Have you seen many accidents happening to men who work in their bargains without ropes?—No; that is the only one that I myself know of.

1323. Do you know of men working with defective ropes?—They are warned not to do so if the manager sees that they are not proper ropes.

1324. Are they compelled not to use them if they are discovered?—Yes.

1325. Is there any other accident that you remember?—There is one on the top.

1326. And what is the next?—That is the last, I think.

1327. Do you remember the case of Morris William Jones?—Yes.

1328. How did that happen?—It was at the bottom of the shaft, in the bottom of the quarry.

1329. How did he meet with the accident?—I am not quite sure. He was working there and something came down and fell on him.

1330. Did something fall from the side of the shaft or above it?—I cannot be certain as to that.

1331. Many of those accidents were caused by rock falling on the men?—I think I know of two cases of that kind, and two cases where the earth fell at the top.

1332. Do you think that the men are responsible for keeping their bargains safe after taking them at the commencement of the month?—Yes.

1333. Do you think it would be advisable for all rock-men to examine the rocks in the morning before commencing to work?—Yes, it would.

1334. Do you do that generally?—Yes, as a rule we have done it for years.

1335. Do you think that any benefit is derived from that?—Yes, I am sure we avoid accidents by doing so.

1336. Do you think it would be a good rule for the Committee to adopt a rule to compel every man to do that every morning before commencing his work?—Yes, I do.

1337. Are there sides at the quarry which are not worked, and where men are working below?—Yes.

1338. Do you think those places ought to be examined periodically?—I have worked in such a place for four years, and never go to it without looking at it.

1339. Is that in your contract?—We are responsible for looking after it, and if there is anything dangerous we are paid for taking it away.

1340. Is that a general rule in the quarry?—Yes, as far as I know.

1341. As far as Penyrorsedd is concerned, this rule is in operation?—Yes, as far as I know.

1342. Do you think it would be a good thing to have a competent person to examine chains, wire ropes, and all machinery at special times; say, for instance, the chain that got loose from the rock in the accident you have just referred to?- Yes, I think it would be a very good plan.

1343. (*Chairman.*) How often do you think that should be done?—I believe they are examined oftener than once a week at our quarry by the man who looks after that.

1344. Do you think it necessary to examine them oftener than that?—I am not sure that that is what he does, but I know that the man who is in charge does look after that.

1345. Do you think it necessary to examine them oftener than once a week?—The oftener the better, in my opinion.

1346. Then how often do you think it should be done?—If it were done daily it would not be out of place.

1347. (*Mr Evans.*) Do you think the men who are in direct charge of this machinery, such as engineers, should examine the machinery daily?—Yes. I think the engineer does it daily, but there is another man who looks after the fastening of them, and he goes round occasionally.

1348. You have a thing called a clamp on the crane?—Yes.

1349. Who fixes those?—The men who are working with the crane on which it is fastened.

1350. You mean the labourers?—Yes.

1351. Not the men on the landing?—No.

1352. Do the same men do that work always?—Yes, as a rule.

1353. Do you think that this is an important matter to attend to, and that it requires great care?—Yes.

1354. You know, I suppose, of some accidents which have taken place in consequence of inexperienced men being put to do this work?—Yes, but not in our quarry.

1355. All your managers are practical men?—Yes.

1356. Do you consider that the quarries of Nantlle are different in one respect to the quarries of Penrhyn and Dinorwic?—I do not know much about those two quarries, but I think they are worked more regular than ours in our district.

1357. And I suppose you will admit that the quarries at Nantlle cannot be worked on the same system as these two quarries?—No, because they are on the bottom.

1358. And you require machinery at your quarries?—Yes.

1359. In some of these quarries you work a gallery from the bottom to a certain height and stop there?—Yes.

1360. It is possible that you may have two or three galleries worked to one depth at that point?—Yes.

1361. If there was a very long length of frontage they would not stand up as they do?—The larger the face the more likely it is to come down.

1362. I suppose you know of some quarries at Nantlle that have been worked into that shape and have come down?—Yes, I do.

1363. And you know there have been serious accidents in consequence?—Yes, several.

1364. Do you remember an accident at Penŵryn?—Yes, Cloddfa'r Lon.

1365. And how many men were killed there?—I remember seven being killed.

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1366. And do you remember an accident at the Dorothea Quarry about the same time?—Yes.

1367. How many men were killed there?—I am not quite certain; it was five or seven.

1368. Do you remember an accident at Cilgwyn of the same nature?—Yes.

1369. And how many were killed there?—I am not certain of the number, but I think it was four.

1370. Do you also remember that another accident happened at Dorothea about eight or nine years ago —Yes.

1371. And that arose from the same cause?—Yes.

1372. Do you think that the quarry should be fenced at the top?—Yes, especially where there are paths not far from them.

1373. Do you think they should be fenced whether there are paths or not?—It is not so necessary to fence where there are no paths.

1374. Do you know of any accidents happening with cranes at the Nantlle Quarries?—Yes, I remember one at Cilgwyn.

1375. And what was the cause of that accident?—I cannot be very sure, but as far as I recollect there was too much weight, and one of the men lost his hold.

1376. Was there nothing to prevent the crane from running—a clip?—There is one to be, but I do not know if there was one in that instance.

1377. (*Chairman.*) What is the practice in your quarry when any danger is seen?—They order those who are working underneath it to go and make it safe.

1378. The manager does that?—Yes.

1379. Do you report to the manager in such a case?—Yes.

1380. Then that is the rule at your quarry?—Yes.

1381. (*Mr. Evans.*) Do you think that any support or buttresses should be left to hold them up?—It would be a great advantage if something were left to hold them up.

1382. Do you think there should be, or do you consider it a matter of indifference?—Yes it ought to be done.

1383. (*Mr. W. W. Vivian.*) You were asked a question as to the difference in the health of the men now compared with years ago?—Yes.

1384. Can you assign any reason for the deterioration?—I think it is mostly due to the difference in food.

1385. You think they took better food years ago than they take now?—Yes, they took more suitable food years ago.

1386. Is there much inter-marriage in your district?—No, I do not think there is.

1387. Which do you think affects the health of the men most, their mode of life or occupation?—Their mode of life, I think.

1388. (*Chairman.*) Do you consider your occupation as a quarryman a healthy one?—I do not think it is as healthy as working on the land.

1389. As an agricultural labourer?—Yes.

1390. Why do you consider it healthier to work on the land?—Because there is slate dust in the quarry.

William Thomas, of Dorothea Quarry, and Henry Williams, of South Dorothea Quarry, were called into the room together.

W. Thomas.

William Thomas, examined by the Chairman.

1391. How long have you worked at the Dorothea Quarry?—For 32 years.

1392. How long have you worked in a quarry altogether—For 45 years.

1393. And how old are you?—I am 52.

1394. Where have you worked in addition to the Dorothea Quarry?—At the Cilgwyn Quarry.

H. Williams.

Henry Williams, examined by the Chairman.

1395. You worked at the South Dorothea Quarry?—Yes.

1396. How old are you?—50 years of age.

1397. How long have you worked at the South Dorothea Quarry?—A little more than five years.

1398. And how long have you been working in a quarry altogether?—For 40 years.

1399. Where have you worked besides the South Dorothea?—I worked at the Vronheulog Quarry for 15 years, and at the Dorothea Quarry before that.

W. Thomas.

William Thomas, examined by the Chairman.

1400. Do you work inside the quarry or out?—I work out in the shed.

1401. Do you work inside the quarry or out?—I work out at present, but I have been working in for many years at Dorothea, and I work in now occasionally.

1402. Have you any suggestion to make with the view to improving the condition of quarrymen?—I have nothing particular to say, but I am willing to answer any questions that may be put to me. I should like to see the quarries under Government control.

1403. What part of the work of the quarry do you consider the most dangerous?—Working in on the rock.

1404. Have you seen many accidents in your time?—Yes, several.

1405. Say during the last 10 years?—Yes, I have.

1406. Can you suggest anything for the better protection of the workpeople?—It requires more care on the part of the workmen, as well as the master.

1407. Is the quarry at which you are employed worked in galleries?—No.

1408. How have the majority of the accidents arisen, as far as your experience goes?—Through falls of rock.

1409. Can you suggest any measures for preventing that?—By widening the tops. As you go down, the tops get heavy, and if much is taken from under it they will fall down.

1410. Is there any periodical examination of the condition of the tops of the quarry?—They do examine them when they think there is anything wrong.

1411. But they do not examine periodically before that?—No, not regularly.

1412. Would you approve of a periodical examination being made?—Yes, I would certainly.

1413. Should that examination be made by the manager or by some person in charge?—It might be done by anybody who would do the work properly.

1414. Would you propose that a register should be kept of such examiuations?—Yes.

1415. Have you had any experience of accidents through explosives?—Yes.

1416. Have you any suggestion to make in regard to that source of accident?—The best suggestion would be for men to take more care with the powder.

1417. Would you approve of a penalty being imposed upon the men for negligence in the use of powder?—Yes, that would be the means of making them more careful.

1418. And in regard o the use of ropes, would you inflict a penalty there?—Yes, that would amount to the same thing.

HENRY WILLIAMS, examined by the Chairman. *H. Williams.*

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1419. Do you approve of the evidence that William Thomas has given?—Yes.

1420. Have you anything to add to what he has said?—I do not think I have.

WILLIAM THOMAS, examined by Mr. W. W. Vivian. *W. Thomas.*

1421. How long have you been working in the shed?—I have been working there, except occasionally, all my lifetime.

1422. In the sheds?—Yes.

1423. You say you want the quarries under Government control?—Yes.

1424. What reason have you for that?—Because there is not sufficient supervision.

1425. What is the supervision at your quarry; what staff is there?—It depends very much upon the workmen themselves. The quarry managers are very willing to remove anything that is dangerous, but it depends upon the workmen to inform them of the danger.

1426. What staff is there at your quarry?—Mr. Owen, the manager; Owen Hughes, and William Griffith.

1427. What is William Griffith?—He is an old quarryman.

1428. What post does he hold now?—He keeps the time of the men, and so on.

1429. Are there any overlookers?—Yes, the overlooker.

1430. Is there a slate examiner?—Yes.

1431. How many are there?—Three.

1432. Are they considered officials?—Yes.

1433. So that makes six officials?—Yes.

1434. Is that all you have?—Yes, and the clerk.

1435. Does he do anything at the quarry except keep accounts?—No, he does not.

1436. So there are six officials in connexion with the quarry?—Yes.

1437. How many sinks are there in your quarry?—Four.

1438. And how many men are there employed at the quarry?—There are about 400 now, but there have been more.

1439. Do you not think that these officials, being constantly on the spot, are more likely to see things than a Government official who would come down say once in three months?—Three of the officials do nothing except look after the slates.

1440. Are they constantly on the spot?—Yes.

1441. Do you not think the other three are sufficient, seeing that they are constantly on the spot?—The workmen, who are continually at their work, are more likely to see things.

1442. Then why do you think it would be better under Government inspection once every three months?—A man does a thing sooner if he is compelled to do it.

1443. Do the officials not compel the men; if an official goes round and finds something dangerous does he not compel the men to remove the danger?—Yes, if he finds that it is dangerous.

1444. Supposing the man does not remedy it after having had his attention brought to it, what takes place?—He is stopped.

1445. And the next thing after stopping a man is to dismiss him?—Yes; they force them to do it.

1446. Do they dismiss them if they refuse to do what they are told?—I do not know of an instance of their refusing.

1447. What did you mean by saying just now that more care was required on the part of man and master?—As far as the men are concerned, they get so accustomed to their work that they get careless, even when they are working underneath.

1448. And when the waggons are in motion?—Yes.

1449. When the official sees that, does he not stop or punish the men?—Yes, he does.

1450. And what else could the Government inspector do?—He cannot be there always, and we are getting more accustomed to the mode of working. We do not approve of the method of working the quarry.

1451. As regards the top, do the officials not lighten the top when ever it is practicable and feasible?—They do not do that regularly, but they do when ever anything happens.

1452. And not until an accident happens?—Yes, that is so.

1453. Are there no rules as regards blasting at your quarry?—Yes.

1454. And also as regards ropes?—No, there is nothing special as to ropes.

1455. Supposing a man has a rotten rope, and his attention is called to it, what is done?—If they happen to see it they would disapprove of it, but it is not often that such a thing happens.

1456. But the three officials in four sinks would be passing round pretty regularly, would they not?—Yes.

1457. If you were one of those three officials how many times a day would you be able to go round the four sinks?—Once a day, and it would be a hard job to do it.

1458. To go round the four sinks?—Yes.

1459. (*Mr. Darbishire.*) Who are the persons who do not approve of the mode of working the quarry?—We as workmen.

1460. And do you suppose that a Government official would show you a better way of working than the owners and the men themselves?—I do not know that. It is an old method, and rather difficult to improve upon.

1461. Do you mean to say you do not approve of the mode of working, and yet you say it is difficult to improve upon?—There is a better method, but I do not know what the expense of adopting it would be.

1462. You propose that the quarry should be worked under Government management?—Yes.

1463. Do you believe the Government management would find those ways out better than the owners themselves?—If they gathered all the rubbish from one sink to a certain place, to a kind of incline, it would be better.

1464. Instead of the system now in force?—Yes.

1465. You say that no one examines the places to see if they are dangerous?—No, not regularly.

1466. In comparing Government inspection with the inspection of the workman and employer, you say the employer's official goes round once a day, and that the workman is there every day; which inspection is best, the inspection of the workman who is constantly there, and the official who visits the place once a day, or the Government inspector who would come periodically?—I do not know what work the official would do. The workman goes to his work in the morning, and works until late, and has no time to look about him.

1467. Do you ever look at the place where you happen to be working?—Yes, we always try to watch the place where we are working.

1468. (*Chairman.*) How often do you think it would be reasonable and desirable for the Government inspector to come round?—Once a month, I should think.

1469. Have you ever made a calculation as to the number of inspectors that would be required to do that throughout the country?—No, I have not.

1470. (*Mr. Darbishire.*) Are you quite sure that no one examines the place to see if it is dangerous?—

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I do not know of any one, except that the managers do.

1471. (*Chairman.*) Supposing you saw a place that was dangerous, what steps would you take?—If I saw it I would show it at once to the manager.

1472. (*Mr. Darbishire.*) You say you approve of fines in case of want of care in regard to powder and ropes?—Yes.

1473. Do you approve of the payment of fines of that sort to the magistrates, and that you should be summoned for them?—Yes, of course unless they would reform.

1474. Do you intend that the penalties should be enforced before the magistrates or how?—I do not know how the penalties should be enforced, but I approve of enforcing a penalty. It is the neglect of keeping such rules that causes so many accidents, especially in regard to explosives.

1475. What do you mean by penalty, do you mean a fine, or suspension, or dismissal?—I do not care whether it is a money fine, or suspension, or how, but what is wanted is a punishment for disobeying orders.

1476. Would you approve of that being enforced by the magistrates?—I do not know at present what would be best, but I do not think it would do for the officials to do it.

1477. Then you would approve of the prosecution of a man who fails to carry out these rules?—Yes, if he disobeys them.

1478. And that if he fails to pay the penalty he should be imprisoned?—I do not know how far to go in that direction, but of course his life is in the question, and all would be done for his own safety. I have known many instances of fatal accidents which arose in consequence of men neglecting to obey orders.

1479. (*Chairman.*) Our business is to endeavour to find out what rules would best serve the purpose?—I feel that quite as many accidents happen through the carelessness of the men themselves as from other causes. The last accident that happened at our quarry was the case of a man with a new rope, which broke.

1480. Was that the case of Hugh Roberts?—Yes.

1481. And it occurred last year?—Yes.

1482. And he fell five yards because his rope broke?—Yes.

1483. (*Mr. Darbishire.*) Do you know of any injury to the health of workmen through working at the quarry?—Nothing very special. I believe the work of a quarryman is not healthy.

1484. (*Chairman.*) Do you yourself enjoy good health?—Yes, I do, but I am an exception to the rule. A great many have lost their health in consequence of chills.

1485. What is the rule in your quarry in regard to men working when they are wet?—They remain there expecting it to get fine, and they do that in a very improper place very often.

1486. Are they allowed to go home whenever they think proper?—There is no permission to go, and we break the rule if we do go.

1487. Can you not get permission to go when you are wet if you wish?—If it is unfit to work, and is late in the day.

1488. Then you may get permission in such a case?—Yes.

1489. (*Mr. Williams.*) You have worked nearly the whole of your lifetime in one quarry?—Yes.

1490. Have there been many accidents in the Dorothea Quarry?—There have been about 21 during the last 10 years.

1491. Can you give us the causes of those accidents?—Eleven occurred through falls of rock.

1492. Are you referring now to fatal accidents only?—Yes.

1493. And you say there have been 21 fatal accidents during the last 10 years?—Yes.

1494. Do you include any that have happened this year in the 21?—No, none have happened this year so far.

1495. Can you name the persons who were killed in those 21 accidents?—I have not got their names.

1496. Do you know how many were killed in the big fall?—Seven.

1497. What do you attribute that accident to?—I attribute it to the water making its way into a split in rock and forcing it out.

1498. That is your opinion, is it?—Yes.

1499. Were you on the jury?—No, I was not.

1500. Did the jury give any opinion at all as to the cause of the accident?—I do not know, indeed.

1501. Have you got the names of the 21 cases of fatal accidents that you have referred to?—I have not got them here, but I have them at home.

1502. How many men were working at the Dorothea Quarry at the time of the accident when seven men were killed?—About 500, perhaps.

1503. Then there were not between 600 and 700?—I have never seen more than 500 or 600 working there when things were at their best.

1504. You say many of those accidents occurred from falls?—Yes.

1505. How did the other accidents occur?—Through men falling, and stones falling from the waggons.

1506. Can you tell us how many men fell, and how many were hurt by rubbish or something else falling from the waggons at the Dorothea Quarry?—I cannot give those figures quite accurately now without being allowed some little time to go into the figures.

1507. I suppose there are accidents of that character?—Yes, and they are all included in the 21.

1508. Would you be able to tell us the figures from any book or paper that you may have?—I am afraid that the causes are not very accurately put down.

1509. (*Mr. Richmond.*) Have you got the names of the 21 who were killed?—Yes.

1510. Will you send me a list of the names, the dates of the accidents, and the cause of death of the 21 cases from 1883 to 1892?—Yes, I will.

1511. (*Mr. Williams.*) You have suggested that the mode of raising rubbish and slabs from your quarry is very old?—Yes.

1512. And you were suggesting a better method?—Yes.

1513. Would it be possible to adopt a method of raising the rubbish and other things through something like a shaft?—I believe it would.

1514. Is that done in any quarry at Nantlle?—Yes, it is.

1515. Which quarry?—The South Dorethea.

1516. Is it done at any other quarry?—I do not remember now.

1517. Do they do it at the Cilgwyn Quarry?—They have been doing it there partly, but there are engines there now.

1518. I suppose the mode you suggest would be a little more troublesome than the present method?—Yes, it would be more troublesome for a long time, until they got it to work properly.

1519. Do you think it would be safer to work in the quarry if they adopted that mode than it is under the present system?—I believe it would. The danger would be confined to one spot in that case, instead of being spread all over the quarry.

1520. How deep is your quarry?—It varies; there is one part between 100 and 120 yards.

1521. How do you go in and out of it?—By means of ladders.

1522. How long are those ladders?—They vary. Some are 20 yards long and the others are less.

1523. Are they wooden or iron ladders?—Wooden.

1524. How many men are allowed to be on one of those ladders at the same time?—As many as can stand on the ladders from top to bottom.

1525. Are those ladders ever examined?—Yes, when one of the rungs is worn out another is put in its place.

1526. But that is repairing it?—Yes.

1527. Then they do not examine them?—I cannot say anything about that. The officials use the ladders themselves.

1528. Are they over-hanging or perfectly straight?—Some over-hang and others are perpendicular.

1529. Do any of them overhang, or do you mean that they slant?—Some of them slant a little.

1530. Those who work out in your quarry work in the shed, I believe?—Yes, that is where the bulk of the men work now.

1531. Are those sheds very high?—Yes, they are rather high.

1532. What is the height of the side wall?—From 4 to 5 yards.

1533. You remember the time when you were working in huts?—Yes.

1534. Is there more dust in the shed than there used to be in the old huts?—Yes.

1535. Is there much more?—Yes.

1536. Which is the healthiest, working in the old huts or in the sheds as they are at present?—There is an advantage and a disadvantage. The sheds are dry, but the old huts were wet, but on the other hand the air was better in the huts.

1537. Is there any ventilation at the top of the shed?—Yes, a little, but we complain that there is not sufficient air passing through.

1538. Have you any side-places there without any ventilation at all?—Yes, there are only doors to go in and out to change the saws, and so on.

1539. You say that there are 400 men working at the quarry?—Yes.

1540. How many of those are there working in the sheds and how many in the pits?—About one-third work in the pits, and the remainder outside.

1541. Do they work in that way all through the month, or do they go backwards and forwards?—They go backwards and forwards, but that is the usual proportion. There are occasions when all the quarrymen are called down to the pits.

1542. You go to work early in the morning?—Yes by 6.30.

1543. And you have your breakfast before you start from home?—Yes.

1544. What do you get for breakfast?—Tea as a rule, but there are exceptions.

1545. And what do you get with the tea?—A little bread and butter.

1546. When do you get a meal after that?—We get a little bread and butter about nine o'clock if we want it.

1547. Where do you get that, where you are working?—Yes.

1548. When do you get a proper meal afterwards?—In the dinner hour at noon.

1549. What do you get then?—Tea.

1550. And what do you get with it?—A little bread and butter.

1551. How do you make your tea?—The boys go to the smithy to boil the water.

1552. And they mix the tea and sugar and everything together in the can?—Yes.

1553. When do you get a meal after that?—Some of us get a little bread and butter at 3 o'clock.

1554. What do you get after you go home, as a rule?—Potatoes and meat, or something of that kind.

1555. Is it fresh meat or salt meat?—It varies, sometimes one and sometimes the other.

1556. Do you get any other meal before you go to bed?—As a rule we take supper afterwards.

1557. And what do you get for supper?—Mostly tea, but sometimes coffee.

1558. Are you speaking of yourself only?—Yes, but most of the other men live just the same.

1559. What time do you go to bed?—From 9 to 10, as a rule.

1560. Do you get any different meals on Sunday?—Yes, we get dinner on Sunday at the proper time. There is not much difference, but we get it at the proper time.

1561. Do you live in your own house?—Yes.

1562. You built it yourself?—No, I bought it.

1563. Is it leasehold?—Yes.

1564. What is the length of your lease?—Sixty years.

1565. How many rooms are there?—Three.

1566. How many are there in your family?—Four.

1567. In the Nantlle Vale you have some epidemic or other very often?—Yes, sometimes.

1568. You do not know what the reason for that is?—No, I do not. They have been saying that the drains are at fault.

1569. Is there much overcrowding in the houses in your district?—No, not so much now.

1570. (*Chairman.*) Have you ever known of any accident arising through there having been too many men on the ladders?—No, I have not. More care is taken now with those, and also with the wire ropes.

1571. (*Mr. Evans.*) You have said that 21 accidents have occurred during the last 10 years?—I cannot be quite sure as to that. I may have included 12 years.

1572. But at any rate there have been a great number of accidents at Dorothea?—Yes, seven were killed in one accident.

1573. And you say that the officials are quite willing to remove any dangerous part that may be pointed out to them?—Yes, they are. There is quite as much fault on the part of the workman himself very often.

1574. Are you referring now to accidents from small pieces of stone or a great mass of rock?—I am referring to the different accidents.

1575. You do not mean that falls, such as the big ones that have occurred, would be pointed out to the officials?—No, I was not referring to that. Those came quite unexpectedly.

1576. Although you and the managers do all you can, a great number of accidents have happened?—Yes, it is impossible to prevent them always.

1577. You think that sometimes accidents occur which could have been avoided?—Yes, as far as we can see, accidents do happen sometimes which could be avoided.

1578. (*Chairman.*) Can you give instances of that?—Yes, there was one accident with a rope.

1579. (*Mr. Evans.*) Working the rocks to a great depth is a source of danger?—Yes, it weakens as it goes down.

1580. Have you a long frontage of rocks at Dorothea, and are they very deep?—Yes, in some places.

1581. Do you consider that dangerous?—Yes, certainly.

1582. Is there any side of the quarry more liable to fall than the other?—Yes.

1583. Which side is that?—The side where the joints are favourable to that.

1584. Do they sometimes undermine part?—They do not work now as they did.

1585. Have they been working underneath it?—Yes.

1586. And do you consider that to work all along the frontage, and very deep, is a source of danger?—Yes, it is.

1587. Is that liable to cause the natural joints in the rock to open?—Yes.

1588. Do you think that would help the rock to fall?—Yes.

1589. You had an accident in one part of the quarry two years ago, where two men fell from the waggon?—Yes.

1590. Were those men inexperienced in that work?—Yes.

1591. Do you consider that it is inadvisable to let men who are not experienced do such work?—Yes, I do.

1592. And do you think there should be a rule to prevent that kind of thing?—Yes.

1593. Do the men go up and down in the waggons at Dorothea now?—No, I think not.

1594. (*Mr. Richmond.*) Is there not a notice forbidding them to go down in the waggons?—I believe there is.

W. Thomas.

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W. Thomas.
30 June 1893.

1595. (*Mr. Evans.*) Have you a good deal of machinery of various kinds at the quarry?—Yes.

1596. As far as you know is there any periodical examination of the machinery and chains?—Yes, but I do not know how often.

1597. Do you recommend that there should be a periodical examination of all the machinery?—Yes, I do.

1598. And do you think those in charge of them should examine them every day?—I think it would be their duty to do so.

1599. What kind of shelter sheds have you for blasting?—There are some kind of huts with slates on the roof, and short tunnels have been cut lately to help those.

H. Williams.

HENRY WILLIAMS, examined by Mr. Evans.

1600. Were you working at South Dorothea when the blasting accident occurred?—Yes.

1601. Do you know of your own knowledge whether there was more than one place of shelter there then?—No, I do not.

1602. If there were two places at that time could that accident have been avoided?—Yes, if they took care to go into them.

1603. In that case that serious accident might have been avoided?—Yes.

1604. I think another man was killed in South Dorothea by stone falling from the wall by the road?—Yes.

1605. Do you think that every man should examine his bargain in the morning before commencing to work?—It is too much for him to do, as things are at present.

1606. What time would it take him to do it?—To fix a rope and to go down it might take him half an hour or more.

1607. But do you not suppose that the rope will be already fixed, and that it will only require throwing over the rock?—Yes, but we cannot be getting the rope over the rock continually.

1608. But you can get it if it is there?—No, we are compelled to keep it carefully.

1609. You generally have a piece of chain at the top to tie the rope to?—No, that is very seldom the case now.

1610. But you had years ago?—Yes, we had.

1611. Which do you consider the most important matter, for a man to spend 10 minutes in the morning to examine his bargain, or to run the risk of an accident in the course of the day?—It is better for him to lose 10 minutes by far, but when we see one day pass without an accident we are not as careful next day as we ought perhaps to be.

1612. But you do say that accidents happen occasionally from this cause?—Yes, because no one goes over the bargains for two or three months. That is the case where I am working.

1613. What kind of a place is that?—It is a rock worked straight down.

W. Thomas.

WILLIAM THOMAS, examined by Mr. Evans.

1614. With regard to the long sides in these quarries, after working to a certain point do you think that a buttress should be left here and there to support those sides?—It would be safer, but it is done otherwise. It is more dangerous in certain states of the weather.

1615. Can you tell us whether anything else will hold the sides of the Nantlle Quarries up in the way they are working them now; you cannot work in galleries in many places?—No, there is no room to work in galleries.

1616. You were working at Cilgwyn at the time of the big accident?—Yes.

1617. Do you remember how steep the quarry was worked before the accident?—It was hanging over so much, that the drops on the top were dropping on the other side of the quarry.

1618. How long ago is that?—It was in 1860.

1619. What time of the day did the accident take place?—It happened in the morning, before daylight.

1620. You do not begin work so early now as you did then?—No, not by half-an-hour, but we begin as early in the winter as we did then.

1621. Do you think if the men had waited a little longer before going to the pit on that occasion, that they could have seen signs of the rock moving?—It would have been easier for them to see.

1622. (*Mr. Richmond.*) With regard to the two men—William Parry and William Roberts—who were killed in 1892, what were they doing; why were they descending in a waggon?—They intended to have the waggon close to the side of the rock, and in order to do that they were obliged to put the clip at a certain spot on the crane.

1623. Ought not that work to have been done with the aid of a rope?—Yes, but they thought they could do it better the other way. One of the men was against it at first, but he agreed to go with the other man.

1624. There was no permission given to them by the officials to do it in that manner?—No, it was the plan of one of the two men.

1625. There was a man killed on the 16th March 1888, by a piece of slate falling out of a waggon in transit. I suppose that man was working underneath a waggon in motion; his name was Price Griffith Humphreys?—It was at night, and he hardly knew that there was a waggon above him.

1626. (*Mr. Evans.*) Is there much night-work done at the Nantlle Quarries now?—Yes, in some of them.

1627. Can you point to any accident besides this that took place at night when the men were at work?—The accident to the seven men occurred at night.

1628. Do you approve of working at night?—No, I do not.

1629. You are against it?—Yes.

1630. What reason have you against it?—Because the men cannot see their danger for one thing, and in addition to that men are not supposed to work at night.

1631. (*Mr. Richmond.*) Is the Dorothea Quarry more dangerous than other quarries at Nantlle?—No, I do not think it is as dangerous as some of them.

1632. But there are more fatal accidents there during the 10 years than at any other quarry?—Yes, very likely, but the accident to the seven men has increased the number, or Talysarn would be worse off.

1633. (*Mr. W. W. Vivian.*) Have you ever asked the officials to provide ventilation in the shed?—No, I have never done so myself. I do not know whether any one else has done so.

1634. You have not heard of any of the men asking for it?—I daresay many of them have done so on behalf of the men, but it has not been done officially.

1635. Have you any reason to think that the official would decline to do it if the men requested it?—No, I have not.

1636. How did you work out the figures showing that one third of the men work in and the remainder out?—I counted those that worked in the quarry, and I asked the clerk for the number of men working in the whole of the quarry, and I deducted one from the other.

1637. For how many days did you count them?—Only one day.

1638. And how many men were employed in counting?—Four.

1639. In different parts of the quarry?—Yes.

1640. What did you include in the figure, quarrymen proper, or men working in the rock?—The whole of the men working, the labourers and rockmen.

1641. Where did you put the Rubellers?—Out.

1642. What about the engine-drivers?—They are included in the largest number.

1643. They are included in those who work outside?—Yes.

1644. But the engine-drivers go into the quarry, do they not?—There is a drilling engine, and one engine-driver belongs to that. *W. Thomas.* 30 June 1893.

1645. And where was he counted?—With them in the quarry.

1646. You consider his return was taken in a fair and satisfactory manner?—We were quite satisfied with the way it was taken.

HENRY WILLIAMS, examined by Mr. W. W. Vivian. *H. Williams.*

1647. Do you go to your bargain every day throughout the year without examining it?—I work in the shed now, but I think I can answer for those who do work in the bargains that they go without making any examination at all.

1648. Without making any examination at all?—Yes, not every day. They go down on one side of the quarry, and their bargain is on the other side.

1649. Do you say that the man who works on a bargain does not look at his bargain at all?—He sees what is close to him, but he does not make any special examination.

1650. You do not begin work before there is a good light, do you?—It is not quite dawn when we commence.

1651. But there is a fair light, I suppose?—It is better than it used to be. We commence work when the horn blows.

1652. But the horn blows when there is a good light?—It blows before it is properly light.

1653. What are your shortest hours?—From a little before 8 in the morning until 4.30.

1654. And what is the month or months or weeks in which you work those hours?—In the middle of the winter, when the days are shortest.

1655. For what period do you work for those hours?—About the end of December and the beginning of January.

1656. And then it comes to 7.30 and a quarter to five?—It gradually changes. There is no rule about that.

1657. Do you think there are more accidents at night than in the daytime?—No, I do not think that.

WILLIAM THOMAS, examined by Mr. W. W. Vivian. *W. Thomas.*

1658. Do you think there are more accidents at night than in the daytime?—There is a difference. Those that work at night work at a distance from the sides, loading rubbish.

1659. But you do not think there are more accidents by night than there are in the daytime; supposing there are 10 men working at night against 10 working in the daytime?—I cannot answer that question.

1660. (*Mr. Evans.*) What is the number of non-fatal accidents compared with fatal accidents at your quarry?—I cannot say, I am sure.

1661. Are there a great number of non-fatal accidents?—Yes, a great number.

1662. Would you say that there are five non-fatal for every fatal?—I think there are, but I cannot be quite certain.

WILLIAM WILLIAM JONES, of the Talysarn Slate Quarry, and JOHN ROBERTS, of the Vronheulog Slate Quarry, were called into the room together.

WILLIAM WILLIAM JONES, examined by the Chairman. *W. W. Jones.*

1663. For how many years have you worked at Talysarn Quarry?—For two years.

1664. Had you been working in any other quarries before that?—Yes, I have been working in quarries all my lifetime.

1665. What quarries have you worked at?—At the Penybryn and Dorothea.

JOHN ROBERTS, examined by the Chairman. *J. Roberts.*

1666. How long have you been working in slate quarries?—For about 40 years.

1667. What quarries have you worked at?—A Penyrorsedd, Dorothea, Talysarn, and Bryneglwys.

WILLIAM WILLIAM JONES, examined by the Chairman. *W. W. Jones.*

1668. Have you any suggestions to make with reference to the prevention of accidents to those working in the slate quarries?—We would rather answer questions on the various points.

1669. Can you suggest anything?—I believe that the accidents that take place in consequence of falls of rock could be diminished. I find that 20 or 22 fatal accidents have taken place in the Nantlle Vale during the last 10 or 11 years owing to falls.

1670. Have those been falls of rock or falls from waggons?—There have been accidents from both causes, but mostly from falls of rock.

1671. Would you consider it advisable that those places should be periodically examined?—Yes, I believe that they should.

1672. That would reduce the number of accidents, probably?—I have no doubt about it.

1673. By whom do you suggest the inspection should be made?—The managers should appoint competent men to examine them periodically, and provide proper ropes and other articles necessary to do the work.

1674. Do you consider that the owner of the quarry should provide the ropes?—Yes, for that purpose he should, and everything else that is necessary.

1675. For the purpose of the examination?—Yes.

1676. And that a person should be appointed to go round periodically to examine the face of the rock?—Yes.

1677. And that a record of that inspection should be kept?—Yes. Examinations are now made after an accident, but there is no regular examination of the quarry. In fact, there is no examination at all unless something wrong is noticed, such as a piece of rock moving.

1678. How do you find the rock moving except by examination?—Sometimes small pieces are found falling from its face, and at other times the big joints or the slants are found opening.

W. W. Jones.
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1679. (*Mr. Darbishire.*) Who is it that notices these joints and slants?—Perhaps the man who works in the bargain below that, or perhaps someone else who may be paying attention to it.

1680. Who is the other person who may be paying attention?—There are some men who do pay special attention to such things more than others.

1681. And yet you say there is no regular examination except after an accident?—I have been calling the attention of men at times to what I considered dangerous above their bargains, but it was no part of my business to do so. If a regular examination took place monthly by a proper person it would be very difficult for any accidents of that kind to take place.

1682. That is your opinion?—Yes.

1683. (*Chairman.*) Whose attention do you call to these things?—If it is only a small portion moving, the men who work below it are warned, but if it is a large piece of rock the attention of the manager or one of the officials is called to the matter.

1684. Are there many accidents in the quarry in which you are employed?—Yes, a great many.

1685. How many have there been during the last five years?—I am not quite certain, but I have them down.

1686. How far back does your record go?—From the year 1880.

1687. Can you give the figures from 1883?—Yes.

1688. For Talysarn alone?—Yes, and Blaenycae.

1689. Which was the first in 1883?—A man named Robert Williams.

1690. Was that on the 24th February?—Yes.

1691. There were two others in 1883, Robert Ellis Jones and John Williams, and the accident happened on the 20th October, that makes three for the year; have you got those?—No, I have only got the first one. I do not claim that my list is perfectly accurate.

1692. In 1884 what have you?—January 3rd, William Williams, and February 28th, Thomas J. Williams.

1693. What have you next?—I have none afterwards until 1886.

1694. Who are those?—It was the case of a boy. I do not know his name.

1695. Was it on the 4th September?—Yes.

1696. A piece of rock fell upon him?—Yes.

1697. (*Mr. Richmond.*) What have you in 1887?—May 12th, Owen Owens.

1698. A piece of rock fell upon his head?—Yes.

1699. And what have you next?—May 14th, 1888, William Hughes; July 31st, William Thomas Williams, falling from an upper gallery; October 12th, Owen S. Jones, the breaking of a chain.

1700. What have you in 1890?—Richard John Morris and Moses Jones, Blaenycae, and there are two after that in Blaenycae.

1701. Is there another case in 1890?—No.

1702. What is there in 1891?—A stone fell from the rock above and struck Griffith David Jones on his head.

1703. Have you anyone in 1892?—No, I have not.

1704. Do you know how many there are working at Talysarn now?—About 400.

1705. Is it not 310?—I do not know, I thought it was more than that.

1706. There are less working there now than there used to be some years ago?—Yes, there are.

1707. (*Chairman.*) As those accidents, or most of them, have occurred from falls, are you of opinion that proper inspection of the face of the rock would prevent many of them?—Yes, I believe that. Many of them happened through small lumps of stone falling, and not a great mass of rock, and they happened very often after a change in the weather, such as frost or rain.

1708. Have any accidents taken place there from blasting?—Yes.

1709. There was one in 1883 to a man named Robert Williams?—Yes.

1710. He was struck on the head in blasting?—Yes.

1711. Did that accident happen because proper precaution was not taken?—It was his own fault in not going into the shelter. He was standing at the entrance.

1712. Would you approve of a rule compelling the men to go into a place of shelter?—Yes, if it is possible to have it, I would.

1713. (*Mr. Richmond.*) Would you approve of the men being held responsible for not going into the shelter, and be brought before the magistrates?—Yes, certainly, inasmuch as the owners prepare proper shelter for them and they do not make proper use of it.

1714. (*Chairman.*) Have you proper shelters, in your opinion, at present?—At Blaenycae Quarry there are two tunnels for the men to go into. I cannot say for the other part of the quarry now, because they have taken the sides down.

1715. Have you any rules with regard to the sounding of an alarm during blasting operations?—There is not at Talysarn, but the man who has a blast shouts out. In most of the quarries there is a horn to warn the men.

1716. Do you think that to shout out is sufficient?—I believe it is. I am not aware that anyone has been killed in consequence of being unaware of a blast.

1717. But what is your idea about the danger of it?—The best rule is to whistle every hour, but there are circumstances sometimes when it would be wise to change that. We do not blast very often at Talysarn.

1718. Have you a copy of these rules (*produced*) hanging up at your quarry?—I cannot say. I have never seen any.

1719. I suppose it would be desirable to put rules up at the quarry?—Yes, it would certainly be desirable. But the best thing would be for the manager and officials to see that the rules are carried out after they are put up.

1720. (*Mr. W. W. Vivian.*) What are you at the quarry?—I work in the quarry.

1721. On the rock?—In making slates.

1722. In the shed?—Yes.

1723. Have you ever worked on the rock?—Yes.

1724. How long is it since you worked there?—10 years ago.

1725. And you have been in the shed ever since?—Yes, except occasionally.

1726. How long have you been working in slate quarries?—For 44 years.

1727. Have you ever met with an accident?—Yes.

1728. What was it?—A chain broke, and the end of it struck me in my leg.

1729. Did it hurt you much?—Yes, I was at home for two months.

1730. Does your partner examine his bargain in the morning, where he is to work all day?—No, except there is rain or a thaw.

1731. There is no rule to examine the bargain every day?—No, there is not.

1732. Do the officials not give you directions as to that?—No, unless they think there is something dangerous.

1733. What are the number of officials at Talysarn?—There are three agents and Mr. Robinson himself.

1734. And Mr. Robinson has a son, has he not?—Yes, I count him as one of the three.

1735. Are there slate examiners?—Yes.

1736. Are they responsible for assisting in the carrying out of the rules and regulations?—No, they have nothing to do with that.

1737. So there are three responsible officials?—Yes, there are.

1738. Do you not think that the staff take sufficient care?—It is difficult to say, but I believe they do their best.

1739. But there are certain rules in existence, are there not?—I do not know of any.

1740. You do not know of any rules at all?—No nothing but our custom.

W. W. Jones.
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1741. Have you never heard of an official speaking as to anything being unsatisfactory with the men, such as a rotten rope, and so on?—Yes, I have.

1742. In what way has the official spoken; has he found fault?—He said that they should buy a new rope.

1743. And did they buy a new rope?—Yes, they did.

1744. Supposing that they did not buy that new ropes what do you think would have happened?—I cannot say anything as to that.

1745. Has there ever been a case of fine, suspension, or dismissal for disobedience to any official?—I do not know of any.

1746. You do not?—I do not know of any instance of that kind, but I have known of instances where men have not come to their work and have been discharged in consequence.

1747. That shows that there are certain rules in existence?—Yes, there are rules with regard to the working.

1748. And you have said there is a rule also as to the ropes, and also as to the blasting?—There is no rule as to inspecting the ropes or anything of that kind, but when the manager finds ropes that are bad he will speak about them.

1749. These officials, four in number, are pretty often about the quarry, are they not?—Yes, they are there constantly.

1750. How long will it take one of the officials to go round the whole of the quarry?—About two or three hours.

1751. So that the officials go pretty constantly round?—Yes, they are there constantly.

1752. (*Chairman.*) Are there any rules exhibited at all?—Yes.

1753. Is there a copy of the Factory Act put up at the quarry?—I have not seen any, but I cannot be certain.

1754. (*Mr. W. W. Vivian.*) Do you consider that more rules are requisite, and that the understanding that now exists is not sufficient?—It would be better if there were rules put up as to ropes, and tops, and blasting, and so on. It would be a great improvement, in my opinion.

JOHN ROBERTS, examined by the Chairman.

J. Roberts.

1755. Do you agree with what William William Jones has said?—Yes, I do.

1756. Have you anything to add to what he has said?—I do not think I have, except that I think there ought to be a rule with regard to the use of powder.

1757. What would you suggest?—There ought to be a rule that a man should be experienced, and that men who are not experienced should be kept away from powder.

1758. What is the practice in the quarry at present as to powder?—The tendency is to put men to blast who are not experienced. Men are allowed to handle powder who have not been accustomed to it, and I do not think that sort of thing is right.

1759. Where is the powder kept?—In a warehouse near the quarry.

1760. Is it given out to the men by the manager, or how?—It is given out by a man appointed for the purpose.

1761. Are you speaking now of the Vronheulog Quarry alone?—No, of quarries in general.

1762. In which quarry does that sort of thing go on?—It has been going on in several quarries for some time, but I cannot say whether there is any improvement in them at present.

1763. Which quarries are you referring to?—I know that labourers who have never been using powder before have been allowed to handle it.

1764. Do you remember any accident occurring on that account?—No, I do not.

WILLIAM WILLIAM JONES, examined by the Chairman.

W. W. Jones.

1765. Have you anything else to say?—I cannot recommend the mode of working which now exists at Nantlle in many respects.

1766. Will you name some of the things you disapprove of?—One thing is that the rocks are worked too steep, and that long breasts are allowed to the rocks.

1767. And I suppose that would be remedied by proper inspection?—Yes. A long side and a great depth give advantage to the rock to fall down suddenly. In quarries where the tops are covered with gravel, the gravel is not sloped enough, and lumps fall down, which are a source of danger to the quarrymen below. I also think that the chains in many places ought to be done away with.

1768. Do you mean the general mode of working, and not the chain only?—Yes, the existing mode of raising.

1769. What would you suggest as an improvement?—In many cases it is possible to arrange for winding perpendicularly, and that would be to the advantage of the men and the masters. It would be safer, and it would do the work quicker. It is impossible for the men to work now in some quarries without working under the waggons when they are ascending. The chains cross each other, and it is impossible for the men to work without being under these chains, and they are therefore in constant danger.

1770. Would you propose to establish a rule to prevent the men working under these chains?—Yes. There is one quarry that I know of where the system has been changed—the South Dorothea. They wind along an upright incline there, and they wind three now where they could only do one formerly.

1771. Do you mean that one engine brings up as much as three engines did formerly, or that there is three times as much material being brought up?—Three times as much rubbish is brought up now. If one engine is able to wind three waggons in the time that it took to wind one before it is a gain to the masters.

1772. How do you mean?—If there were sufficient hands put there it would raise three times what it did formerly.

1773. (*Mr Evans*). To be safe, how near to the edge of the quarry would you put a rail where there are men working below?—At least four yards.

1774. You do not think that less than four yards would be safe?—No, I do not.

1775. Would you allow less where there are no men working below?—Yes.

1776. What would you allow in that case?—Three yards.

1777. Why would you allow so much where there is nobody working down below?—Sometimes the waggons get off the rails, and the men with them might fall over.

1778. Have you ladders for descending the quarry?—Yes.

1779. And are they kept in good order?—Sometimes they are.

1780. Do you think they should be looked after and kept in proper order?—Yes. When attention is called to them now they are kept properly.

1781. Do you think they should be looked after periodically?—Yes, they should be inspected periodically.

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1782. Do you think a competent man should be employed to examine the machinery periodically?—Yes, I do; most certainly.

1783. Have you any quarries about you that should be fenced?—Yes.

1784. And are they near roads or paths?—Yes, they are.

1785. Is there any blasting at the Nantlle Quarries which is dangerous to the public?—Yes.

1786. Do you think that that should be looked after?—Yes, certainly; on the road-side in particular.

1787. Is there much water left at the bottom which keeps the men's feet wet?—Yes, in many cases there is.

1788. Do you think that it is possible to remedy that to some extent?—Yes, it is possible to remedy it.

1789. And do you think it should be remedied?—Yes. There are some men who work with their feet wet throughout the day.

1790. You say that a long side of top rocks is dangerous?—Yes.

1791. Can you point to any accident which took place within your recollection in consequence of that?—Yes, I remember two.

1712. At which quarries did they happen?—At the Penbryn and Dorothea.

1793. Do you feel certain that the cause of those accidents was the undermining?—Yes, working with too much frontage and depth.

1794. Do you think the men should be allowed to throw rock down without giving sufficient warning to the men who are working below?—No, they should not.

1795. Do you think that the man who has to throw down should see that the men have removed from underneath before he does so?—Yes, he should. I wish to speak strongly on this point, as there have been cases where this matter has not had proper attention, especially at inquests.

1796. Do you know of any accidents in the olden times at Nantlle where no inquests were held upon the men?—I know of accidents where the men lived for a little time afterwards and there were no inquests held upon them.

1797. How long did they live after the accidents?—For a fortnight or three weeks.

1798. I suppose you think that every quarry manager should be a practical man?—Yes, he ought to have a certificate to show that he is qualified to manage a quarry.

1799. Do you think that every man who takes any responsibility in connexion with the management of a quarry should have a practical knowledge?—Yes, he ought to be a practical quarryman.

1800. (*Chairman.*) Have you any cause of complaint now with regard to the question of inquests?—I believe that they are of very little use.

1801. But are they held when they should be held?—Yes, they are held now.

1802. Have you anything else to say?—I hope the Committee will pay attention to the question of better accommodation for the men to take their meals in.

1803. How is the place that you work in situated in that respect?—There is no accommodation of that kind at all.

1804. And is that at all a common deficiency at the district?—Yes, it is. I only know of Mr. Darbishire's quarry where there is any accommodation for the purpose.

1805. (*Mr. Darbishire.*) Would it not be quite as convenient if the men went to a coffee house in the neighbourhood and had their own choice in the matter?—If they could get what they want on reasonable terms, but a building with a place where the men could warm their food would be better. I know of cases where men have left their work in a state of perspiration, and afterwards getting inflammation and dying in consequence of their having to stay out in open air in all kinds of weather to eat their meals.

J. Roberts.

JOHN ROBERTS, examined by Mr. Darbishire.

1806. What is your opinion on that point?—I believe there is too much working in the rain in the open air.

1807. (*Chairman.*) Is that not very much in the option of the men?—We want to keep the slate-makers well supplied with blocks, and that induces us to keep on working.

1808. But supposing a man thinks it is so wet that he ought not to work, would he be prevented from leaving the quarry?—I cannot say, I am sure.

1809. Has such a case ever happened to you?—No, I have never broken the rules. I know that if I go away I will be breaking the rules, and I have nothing but the quarry to depend on for a living.

1810. (*Mr. Darbishire.*) Is there a rule that you will have to work whether it is wet or dry?—After beginning a day or half a day it is the rule to stay there until the time is up

1811. In which quarry is that a rule?—In every quarry through the district.

1812. (*Mr. W. W. Vivian.*) Do you mean to say that if you went to the official to ask him for permission to go home that you would not get leave from him?—No, I do not say that.

1813. So you would get permission?—I cannot say.

W. W. Jones.

WILLIAM WILLIAM JONES, examined by Mr. W. W. Vivian.

1814. What do you say as to that?—There is no rule on the subject. You will find that they work in one quarry under such circumstances and not in another.

1815 If you asked permission to go home on a wet day would it be refused?—I do not think so. This is the difficulty in the matter, there are different kinds of men. Some can stand working out in the rain, and if the agent finds that one man is working and another is not ready to go he will say to the latter, "So-and-so is working, and why do not you?"

1816. Do you know of anyone who has been refused permission after he has asked?—I know of cases where some men have gone down to their work, and the agent has said to others who were not willing to go, "Those men have gone to their work, and you ought to go."

1817. But if they said they did not want to go, and asked permission to go home was it refused?—No.

1818. (*Chairman.*) Have you yourself ever known a case where you have said that it was too wet to work, and have asked for permission to go home, and it has been refused?—No, I do not, but I know of a case where some men had gone down to work on a wet day, and others were unwilling to go, but they were compelled to go after them.

1819. (*Hon. W. W. Vivian.*) How were they compelled to go after them, were they threatened with dismissal?—They were told to go down.

APPENDIX III. (A.)—*cont.*

THIRD DAY.

At the George Hotel, Menai Bridge, 4 August 1893.

PRESENT:—

Mr. Frank N. Wardell, in the Chair.
Hon. W. W. Vivian,
Mr. W. A. Darbishire,
Mr. W. J. Williams,
Mr. J. J. Evans,

Mr. H. S. Richmond, Secretary

Hugh H. Davies, Jeremiah Thomas, William R. Evans, and Robert J. Parry, were called into the room together.

Hugh H. Davies examined.

H. H. Davies, &c.
4 Aug. 1893.

1820. (*Chairman.*) Do you all work at the Penrhyn Quarries?—Yes.

1821. Are you all quarrymen?—Yes.

1822. Quarrymen proper?—Yes.

1823. With regard, first of all, to the use of explosives, will you tell the Committee what you have provided in the way of shelters in your quarry?—We have huts provided for us.

1824. Are they what are called "shelter sheds"?—Yes.

1825. What rules are there in force with regard to signalling when shots are about to be fired?—A bell is rung every hour.

1826. But does that mean that the bell rings every hour whether there is blasting or not?—Yes.

1827. Is the bell rung once only every time?—No, it is rung three times.

1828. How does it ring, what intervals are there between them?—The first rings as a signal for us to go to shelter, the second to ignite the fuse, and the third for us to return to our work.

1829. But what is the interval between the first and second, and the second and third?—One minute is allowed between the first and second, and four minutes between the second and third.

1830. That makes five minutes altogether?—Yes.

1831. Have there been any accidents at the quarry, within your recollection, from blasting in any way?—Yes, several.

1832. Do you mean fatal accidents?—Yes, there have been some fatal.

1833. I suppose it is gunpowder that is used at your quarry?—Yes, and glycerine as well.

1834. What is the rule there as to the storage of gunpowder?—They have built a large magazine there.

1835. Is the powder given out to the men every day, or how?—Yes, every day.

1836. To every man?—Yes.

1837. What do you do with the surplus powder that you do not use?—We keep it in a tin flask.

1838. And where do you keep the flasks?—In the shelter sheds and in the walls; in the safest place that we can find.

1839. What is the height of the galleries in your quarry?—They vary from 12 to 22 yards, but the average is about 18 yards.

1840. And what is the average breadth of the galleries?—They vary considerably, from 6 feet to 15 yards.

1841. What is the distance as a rule between the rails of the tramways and the edge of the gallery, the outer rail?—There are some with only 12 inches between.

1842. Are there any of the galleries which are fenced at the edge in any way?—I only know of three galleries at the top of the quarry that are fenced.

1843. And in what way are they fenced?—Flags have been put there as a protection.

1844. Have they been placed upright?—Yes, and in other places, where they have been pulling down close to the tramway, they have put flags and timber.

1845. Are you referring now to the top of the quarry?—No, they are in several places throughout the quarry.

1846. Those kind of fences are to be found in the intermediate galleries?—Yes.

1847. Has there been any accident at your quarry through men falling from the top of the quarries or through something falling from the waggons upon them?—Yes, two.

1848. Were those fatal accidents?—Several have fallen over the galleries and been killed.

1849. What do you mean by "several"?—A good many men.

1850. For how many years have you been working at Penrhyn Quarry?—For 26 years. (The last question was put to each of the other witnesses, and they replied as follows:—William R. Evans, 47 years; Jeremiah Thomas, 16 years; and Robert J. Parry, 34 years.)

1851. Can you see any objection to these galleries being fenced in some way or other? No, it would be a good plan if that were done, but it would be better if the galleries were made wider in those places.

1852. I suppose you consider 15 yards wide enough for a gallery?—Yes, but those are exceptional places.

1853. But take the galleries where they are obliged to be narrow, can you see any objection to their being fenced?—No, if they put them wide enough, so that there will be sufficient room between the tramroad and the edge of the gallery.

1854. Do you consider it possible to fence a gallery where a tramway runs a foot from the edge?—Yes, and there are such places where they might remove the tramway further back.

1855. Are there many galleries in your quarry where the tramways are within a foot of the edge?—No, there are not many at that distance. I have only found two such places.

1856. (*Mr. Vivian.*) Is that in a gallery?—Yes.

1857. You say you know of two galleries with the rail 12 inches from the edge?—Yes.

1858. About how many galleries are there in the quarry?—There are 18 from the bottom to the top.

1859. How far do the galleries run with the rail 12 inches from the edge before they branch off and get wider?—It is just a gap of about two yards that is so narrow as that.

1860. Then these narrow places do not run any distance?—No, but perhaps you get another gap in the same gallery something like it.

H. H. Davies, &c.

4 Aug. 1893.

1861. (*Chairman.*) Are there any wire ropes in use at the quarry where waggons ascend or descend?—Yes.

1862. What do you mean by wire ropes, how are they used?—They are used in water balances, and in inclines, and in the ladders.

1863. You mean rope ladders?—Yes.

1864. Are there any sinks at your quarry?—Yes.

1865. How are the ropes provided, do the men find their own ropes, or are they supplied by the proprietors?—We provide our own.

1866. Are those ropes examined by anyone, by anyone in charge at the quarry?—I believe that is supposed to be the rule, but a great many defective ropes are used there.

1867. Who says that they are defective, the men themselves or who?—The men themselves, and the officials say so as well.

1868. Are they ever found to be defective by the officials?—I know of some that ought to be found.

1869. But have you known instances where they have been found defective?—Yes, and they have broken them and thrown them away.

1870. Are there many accidents at the quarry in connexion with the ropes breaking?—I only know of one myself.

1871. Are there any rules posted up at the quarry?—Yes, there are.

1872. Are they printed or written?—They are printed.

1873. How many men are there employed at the Penrhyn Quarry?—I am not quite certain of the number, but there are about 2,500.

1874. With regard to your living, are there barracks at your quarry, or do you all live away?—All the men live outside the quarry except one or two of the officials.

1875. What do you mean by "outside the quarry"?—There is not one of the men who lives on the quarry premises.

1876. Do they live at a considerable distance from the quarry?—Some are close by and others live a long way off.

1877. Do some of the men live in barracks for the week, and go home on the Saturday?—No, but some of them are in lodgings near the quarry, because they live too far.

1878. (*Mr. Darbishire.*) Have you ever known an accident which happened in keeping the powder in your own store-place?—No, I do not know of one.

1879. You say there are many cases of men falling over the galleries?—Yes.

1880. Were those fatal or were they not?—Several accidents have happened in both ways.

1881. But have there been any fatal accidents?—Yes. I cannot say the number. Many have fallen over the galleries and been killed. I do not know in respect of what period you are asking. (Robert J. Parry added: Several accidents have occurred through men falling over the galleries, but these have not always arisen owing to the gallery being too narrow).

1882. Have there been any accidents through failure of ropes in the water-balances or on the inclines or with the ropes?—I only know of one case where a man fell from a defective rope ladder.

1883. What was his name?—Hugh William Parry, Caellwyngrydd.

1884. And how long ago is that?—It is 20 years ago.

1885. (*Mr Williams.*) Can you give us the average distance of the edge of the gallery from the outer rail of the tramway?—There are 14 galleries with the distance varying from 12 inches to 3 feet, that is, special places in those galleries.

1886. Is 3 feet the smallest distance?—No, there are places in those 14 galleries where the rails are within from 12 to 36 inches.

1887. Are there any places where the distance is greater than 3 feet?—Yes, a great many.

1888. Everywhere else the distance is more than 3 feet?—Yes, the places I have mentioned are the narrowest places.

1889. And some are as narrow as 12 inches?—Yes.

1890. (*Mr. Vivian.*) How long are these narrow places?—They are short gaps.

1891. What length are the gaps?—About 2 or 3 yards.

1892. You say they are not more than 3 yards each?—No.

1893. Now what is the length of those galleries, roughly speaking?—They are about 200 or 300 yards perhaps.

1894. (*Mr. Williams.*) Where those galleries are very close to the edge is there any protection at all?—In some of these places there are men working below.

1895. But what protection is there?—They put flags and timber to hold them up.

1896. Do they always put some protection of that kind there?—No, they do not. All those places that I have mentioned were without any protection on the 29th of July.

1897. Is that the day you went round to see them?—Yes.

1898. Are they as a rule in the same state as they were in on that day?—I do not know how long they have been in that way, but they were so on that date.

1899. Were the quarries working on that day?—Yes, in the morning.

1900. What day of the week was it?—Saturday.

1901. Do you consider that those places were dangerous to the men who had to pass with waggons or to the men who were working below?—Yes, they were.

1902. Dangerous to which?—To both.

1903. Do you think that when there is an unavoidable case of that kind there ought to be protection, that is, when they cannot remove the tramroad?—Yes, there ought to be by all means. In some instances they could remove the tramway.

1904. With regard to throwing down; since your quarry is worked in galleries, and there are 18 of them, is it dangerous to throw down from the top of a gallery where there are men working down below?—Yes, in many places in those galleries.

1905. What is the rule when you are throwing anything down?—Some "crews" get special rules from the officials.

1906. What are those special rules?—That they shall not be allowed to throw anything down during the dinner hour, or after 3.30. in the afternoon.

1907. (*Chairman.*) Are those special rules the same as you spoke of just now as being posted up at the quarry?—No.

1908. They are orders given to the men?—Yes.

1909. And not printed rules?—No.

1910. (*Mr. Williams.*) Have you any rules as to throwing down posted up at the quarry?—No, not as far as I know. I believe there were some rules about ten years ago.

1911. Did you ever see those rules?—I have a slight recollection of seeing them up, but I do not remember much about it.

1912. Can you remember one single rule in the copy which you saw?—Yes, there was one about the ropes.

1913. And what was the rule?—That they were not to use defective ropes, and that the officials were to look after them.

1914. Was there anything about throwing down in those rules?—I think there was a rule that there was to be no throwing down until after warning had been given, and the men down below had gone out of the way.

1915. As a rule you do give warning yourselves when you think there is any danger, I believe?—Yes, we do, but we do not always look to see if the men have gone away after getting the warning.

1916. And you think you are all right if you give warning whether they clear away or not?—No, we do not consider it is right.

1917. Then there is no definite rule that you are to be certain that the men have cleared out of the way before you throw anything down?—No, there is no official rule to that effect.

1918. (*Chairman.*) Do you mean to say that as a rule you do not see that the warning has been attended to?—There are many instances where we do not.

1919. Have there been any accidents in that quarry in consequence of such warning not being attended to?—Yes, there have been several.

1920. (*Mr. Williams.*) Have any accidents of that kind occurred recently?—Yes.

1921. Can you give me the names of the men?—Hugh Thomas was one.

1922. Was that a fatal accident?—Yes.

1923. (*Mr. Richmond.*) Did that occur on the 19th July, 1890?—Yes.

1924. He was struck on the head by a piece of falling rock?—Yes.

1925. (*Mr. Williams.*) Will you describe how that accident occurred?—They were throwing down from the gallery above him, and they had shouted, but Hugh Thomas did not move, and he was struck on the head by a piece of stone.

1926. (*Mr. Darbishire.*) Do you call that an accident?—Yes. They were both at fault, the man at the top ought to have seen that he had gone out of the way, and he ought to have moved after being warned.

1927. But do you call that an accident?—I do not know what your idea of an accident may be.

1928. (*Chairman.*) How was the warning given in that case, by the men themselves, or by an official, or by both?—By the men themselves.

1929. No official had given any warning?—No, as far as I know.

1930. Was it a big fall?—No, there was only one piece.

1931. (*Mr. Williams.*) Generally when you are throwing down there is no official near you?—No, there is not.

1932. They only know that you are at it?—Yes, that is all.

1933. But when you have anything special to throw down, there is generally an official with you?—Yes, in some cases.

1934. (*Chairman.*) If you were to throw down from the gallery above, and you had given warning, and you did not see the man down below get clear away, and you threw down and an accident resulted, would you consider yourself to blame in any way?—Yes, I would be to blame, and the man down below as well.

1935. (*Mr Williams.*) How far did this piece of stone fall on the occasion you have referred to?—About 30 yards.

1936. I suppose this man might have thought that he was safe; did he remove at all from the place where he was working?—I cannot say anything about that. He was a labourer.

1937. Do you know of any similar accident which occurred recently?—Yes, there is one since then.

1938. What was the name of the man?—Hugh Williams.

1939. And when was that?—On the 29th April 1893.

1940. How did that accident happen?—Something came down and struck him on the head and in several other places.

1941. Were they throwing down from the gallery above, or did the stuff fall down itself?—It is very difficult to find out the truth in that case.

1942. (*Mr. Vivian.*) Were the men throwing down at the place at that time?—As far as I can find out they were.

1943. (*Mr. Williams.*) And did they give warning?—They say they did.

1944. And did the man get out of the way?—Yes, there were several men in the place.

1945. And they might have thought that they were safe where they had moved to?—This man went back to the place again.

1946. And they were still working above him?—Yes.

1947. I suppose they did not know that he had gone back?—No, very likely not.

1948. What time of the day were they working there?—It was between 9.30 and 10 on a Saturday morning.

1949. So that was not within the rule as to throwing down in dangerous places?—I understood there was a special rule as to throwing down in that place.

1950. Do you know the rule?—Yes, the rule I have already referred to.

1951. (*Mr. Darbishire.*) Then the men disobeyed the orders they had received?—I cannot be certain of that.

1952. Do you call that an accident?—Yes.

1953. (*Mr. Williams.*) When accidents occur at your quarry; what is the chief cause?—Things falling, and the men themselves falling.

1954. But as to the accidents in throwing down rock?—In the last case I mentioned I am not certain whether the rock fell down or whether it was thrown down, but accidents have happened in both ways.

1955. If your galleries were wider, do you think that so many accidents of that kind would happen?—No, they would not. The place from which the stone came which killed Hugh Williams is about 150 yards deep.

1956. Without any gallery between?—Yes, but there were galleries there at one time; there are none now.

1957. What is the reason why there are no galleries there now?—They have worked those galleries out, and the rubbish has covered them.

1958. What do you mean by that?—There was a great fall at one time, and the place where this rock fell is on the border of that fall.

1959. Did it fall over many galleries?—It fell over the place where the galleries used to be.

1960. You mean that a great fall occurred some years ago and covered up the other galleries?—The rubbish has filled the galleries in that place.

1961. And they are working into the fall in this gallery?—Yes.

1962. I believe you had several large falls in the quarry years ago?—Yes, and during the last few years as well.

1963. Does the brittleness of the rock account for that?—Yes, that is the reason in some places, and in other cases it is the result of undermining.

1964. Does the undermining make the galleries more dangerous or less daugerous?—More dangerous.

1965. And I suppose it is a great loss to both master and men?—Yes, I should think so.

1966. You say that the general height of your galleries is about 18 yards?—Yes, I believe that is the average height.

1967. Supposing a gallery is 18 yards high, what do you think ought to be the width of that gallery in order that the men below may be safe?—Taking the average of the galleries and the nature of the rocks in different parts of the quarry into account, the width, in my opinion, ought to be two-thirds of the height of the gallery.

1968. Then you think the width of those galleries ought to be about 12 yards?—Yes, I do.

1969. And if they are not as wide as that there ought to be some protection there?—Yes, certainly.

1970. The rocks on one side of your quarry overhang, I believe?—Yes, they do, on the left side of the quarry.

1971. Are those safer or more dangerous than the others?—They are more dangerous. There is more weight there, and the rocks are more brittle there as a rule.

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1972. Then you consider that side more dangerous to the workmen?—Yes.

1973. (*Mr. Vivian.*) More dangerous than the gray side?—Yes.

1974. (*Mr. Williams.*) Have you any kind of inspection at your quarry before you commence to work in the morning?—By whom do you mean?

1975. By anyone?—I do not understand that the officials pay any attention in the morning.

1976. Do the workmen?—In most instances they do not.

1977. Then there is no proper supervision of any kind by either workman or official in that respect?—No, not in the morning before the men begin work.

1978. Do you as workmen pay any attention to it at all, or do you go straight to your work in the morning without looking at it?—There are a great many who do not, but there are some men who are more careful than others.

1979. Do you think the bargains ought to be inspected in the morning before the men commence work?—Yes, they ought.

1980. Sometimes they are more dangerous than at other times, such as times of rain and frost?—Yes, they are.

1981. Would you recommend that they be overlooked by someone?—Yes, I would most certainly.

1982. You do not begin to work before daybreak in winter?—No.

1983. And you leave off work at dusk?—Yes.

1984. A great many of the men at your quarry work in sinks?—Yes.

1985. How do you go to your work in that part of the quarry?—Some go by means of the water-balances, and the others by the paths and down the ladders.

1986. Have you a long way to go after you go down by the water-balance?—Yes, in some cases.

1987. And do you go through levels or tunnels?—Yes.

1988. Are those tunnels properly lighted?—Of late years they have been pretty well lighted, but there are some which could be lighted better.

1989. What is the length of those tunnels from the bottom of the water-balance?—I cannot say, but my friends here say they are about 400 yards long.

1990. And how many lights are there in the tunnels?—They vary according to the length of the tunnels and their nature.

1991. Will you mention one of the levels?—The Douglas.

1992. What is the length of that?—About 200 yards.

1993. And how many lights are there?—There were four on the day I was there.

1994. Do you consider those are sufficient?—I think it would be better with one more.

1995. I suppose these water-balances are quite safe?—Yes, but there is one improvement that could be made.

1996. What is that?—The bottom ought to be fenced round.

1997. Does the tank go below the level of the road?—Yes.

1998. And there is danger of the men falling in?—Yes.

1999. Do you know of any who have fallen in?—Yes.

2000. And met with an accident?—Yes.

2001. So you would recommend that they should be fenced?—Yes, I would.

2002. They are worked by water?—Yes.

2003. And the tanks that hold the water are sometimes above the men and sometimes below?—There are three of them with the water above the men.

2004. When the men are under the water do you consider it safe for them to go down as in the case of the others?—It is possible for something to come down and injure the men where the water is below, and on the other hand the water may fall and drown the others.

2005. Would you recommend a shelter to those who have the tank below them?—It would certainly be on improvement, but I do not know of any accident which has happened on account of that.

2006. How often do you get your meals when you are at work?—We have only permission to take one meal at the quarry.

2007. And that is at the dinner-hour?—Yes.

2008. How much time are you allowed then?—An hour.

2009. Where do you go to eat your dinners?—To the huts.

2010. Are the huts properly prepared for you to eat your dinner there?—I consider that they are not suitable.

2011. (*Mr. Vivian.*) Do you mean that they are not properly prepared for your dinners, or that they are not proper huts for you to go into?—They are not proper places for us to eat our dinners in, and to be in for hours on a wet day.

2012. You condemn them?—No, I do not do that.

2013. What do you call them, eating houses or sheds?—They are used for both purposes, to shelter from blasting, and to eat in.

2014. (*Mr Williams.*) Is there sufficient accommodation in those huts for the men who work in the various galleries?—Yes, but there are some of them which are too far for the men to get into.

2015. Will you just describe the eating houses and say what you think of them?—I will describe one, and that is a fair sample of many of them. It is built with stones without mortar, but it is plastered inside. There is a bench all round it and a stove in the middle. In some there are two windows, and in others one. The headroom on one side is from 6 to 7 feet, and on the other side from 8 to 9 feet. I am speaking now of those which are on the galleries alone.

2016. (*Chairman.*) What sort of a stove is it?—It is a cast-iron stove, about 18 inches square. It was made in the quarry out of odd pieces of iron.

2017. And what do you burn in it?—Coal.

2018. Is there a chimney to it?—Yes, an iron pipe through the roof.

2019. (*Mr. Williams.*) You have said that they are not proper places on a wet day to be there for hours. Will you say in what respect they are improper?—There is not enough headroom for one thing.

2020. Have you any ventilation there at all?—Only what comes through the door.

2021. How many men go into this hut as a rule?—The number varies from 20 to 50.

2022. Suppose there is one prepared for 50 men, what would be the dimensions of it?—It would be about 7 yards square, perhaps, but I cannot be sure of that.

2023. Are those huts generally built square?—Yes, they are.

2024. Are you sure your measurement is correct. The room we are now in is only 18 feet long?—I cannot be sure of the measurement. I am giving you the figures as well as I can. My friends here say that the figures I gave applies to the largest huts. In some places it is impossible to make more than one hut there, so that they have to make them large.

2025. Are they similar outside the quarry?—Those outside as a rule are a poorer class.

2026. You are still speaking of eating houses, are you?—Yes.

2027. In what way do you consider that those are poorer?—It is only of late years that huts have been made inside the galleries to eat in. The others were built many years ago, and they are old and in a bad state of repair.

2028. Are the old huts plastered inside as well?—Yes, a little.

2029. Not as well as the others?—No.

2030. (*Chairman.*) Are the ones which are old and ruined in use now?—Yes. There is one thing I should like to say before you leave the question of the eating houses. I consider they ought to be built through with mortar, and that tables should be put

round the place, so that the men may not have to put their food on the ground as they have to do at present.

2031. (*Mr. Williams.*) You have huts or shelters inside the quarry on the galleries?—Yes.

2032. What do you say the length of your galleries are as a rule?—They vary from 200 to 300 or 400 yards.

2033. Taking the average length, how many shelters are there on a gallery as a rule?—I cannot answer that question, but I can say that there are not sufficient on some galleries.

2034. Give us an example of any of the galleries that you know of where there are not a sufficient number of huts?—There is Fitzroy.

2035. What is the length of that gallery?—It is almost circular, and is very long.

2036. And how many huts are there in that gallery?—There are four, as far as I can remember at present. There is a particular place there where there should be one, but there is not.

2037. Can you tell us what the distance is from one hut to another?—In the place where I say there is a hut wanted I believe the distance to the nearest hut is from 120 to 140 yards.

2038. Then you would have to go a distance of 60 to 70 yards to a shelter at that place?—Yes, and the men have to come up from another gallery to shelter.

2039. (*Chairman.*) From the gallery below?—Yes.

2040. (*Mr. Darbishire.*) But you would only have from 60 to 70 yards to go after climbing up?—Yes.

2041. Is there no shelter in the gallery below?—No, not at that spot.

2042. (*Mr. Vivian.*) How do the men go up from the other gallery?—If they are nearer to the top than to the bottom, and it is less dangerous for them to go up, they will do so.

2043. But how do they go up, by a rope?—Yes, as a rule.

2044. When they are working more than half way down in the bargain, do they go down to the gallery below?—Yes.

2045. (*Mr. Williams.*) Is that the only instance you wish to refer to where there is no shelter sufficiently near?—No, there is the case of the sink called "Sink Bach."

2046. What have you to say about that?—There is a distance of 100 yards or more for a man to run after firing there.

2047. What do you think ought to be the average distance between these shelter sheds?—From 100 to 120 yards, so that there would only be about 50 yards for a man to run either way.

2048. Do the men sometimes shelter under the rock instead of going into the shelters?—Yes.

2049. Do you consider that a safe practice?—No, it is not.

2050. Whose fault is it that they do that?—It is partly the fault of the men themselves, but another shelter ought to be provided for them to go to. The men who can go after the first bell is rung can go to the present shelter, but those who have to fire are not able to reach the place in time.

2051. Would you recommend that no one should be allowed to shelter under those rocks in that way?—Yes, I would certainly.

2052. And would you inflict a fine upon them for doing so?—Yes.

2053. What is the custom in your quarry on a wet day, do you work through the rain?—If it commences to rain about 12 o'clock, and continues to rain until say 3 or 4 o'clock, the men go home from the galleries.

2054. Sometimes it rains when you go to work in the morning, what do you do then?—If it rains heavily they do not commence to work as a rule until it gets fine.

2055. Suppose they work for an hour or two, and it then comes on to rain heavily, what do they do?—They go to the huts for shelter.

2056. You are not prevented from going home, are you, if you get wet early in the day?—I cannot point to a case where there has been any objection raised.

2057. I am simply referring to the general rule—the rule is that you can go home if you get wet, I suppose?—Yes, that is the custom.

2058. Some of the men work inside the quarry and the others outside, dressing and splitting slates, and so on?—Yes.

2059. Do you consider quarrying a healthy occupation?—No, I do not indeed.

2060. What is your reason for that opinion?—Those who work slabs in the huts consider that those huts are not suitable to sit in all day long in cold weather. The slate dust also gets into one's stomach.

2061. How do you know that?—The doctors say so for one thing, and it tells on the men themselves.

2062. After you have been working in one of those huts all day long, are you covered with dust?—Yes.

2063. Everywhere?—Yes.

2064. (*Mr. Vivian.*) You are now referring to the dressing sheds?—Yes.

2065. (*Mr. Williams.*) They are very cold in winter, are they not?—Yes.

2066. One side of the sheds is open?—Yes, and they are built very loosely, so that the draught comes through.

2067. Have you noticed that it is a good deal colder in winter inside the quarry than it is outside?—Yes.

2068. What is the reason for that, do you know?—The rain is partly the cause of it, and the way that the quarry is opened. The frost and snow are also another cause.

2069. But you have frost and snow outside in the country round about just the same?—Yes, but you move about more in the country, as in the case of a farm labourer.

2070. Is there anything in the slate itself, do you think?—Yes, it is cold and damp.

2071. Is the slate colder than ordinary material in winter, and hotter in summer?—Yes.

2072. Have you ever noticed that?—Yes, for the last 26 years.

2073. When the slates are exposed to the sun in summer they get very hot, do they not?—Yes, they get so hot that you cannot bear your hand on them.

2074. And they throw that heat to your face and body generally?—Yes, that is so.

2075. And it is so much hotter by reason of that than it is in the country round about?—Yes.

2076. With regard to your mode of life, what time do you go to work in the morning?—At 6.30.

2077. And you get your breakfast before you start?—Yes.

2078. What do you as quarrymen get for your breakfast as a rule?—Tea and bread and butter.

2079. And you get your dinner in the quarry?—Yes.

2080. What do you get at that meal?—It is generally bread and butter.

2081. And then you have a meal after you get home in the evening?—Yes.

2082. What do you get then?—Generally potatoes and bacon.

2083. Do you get tea with that meal?—No, it is not usual to take tea then.

2084. You eat a very hearty meal then?—Yes, as much as we want.

2085. Do you ever eat heavily after you go home from the quarry, or is it only an ordinary meal?—It is only the same as another meal.

2086. And then you lie about and go to sleep straight off?—No, we do not. That is the only time we get to attend to our gardens, and go to chapel, and do errands and such things.

2087. Then it is not the rule for you to lie about and go to sleep after that meal?—No, certainly not.

2088. Do you take another meal after that before going to bed?—Yes, we take our supper.

2089. And what do you get then?—Tea as a rule.

2090. So that as a class of workmen you live mostly upon tea and bread and butter?—That is the general practice, as far as my knowledge goes.

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2091. Many of you live in your own houses, I believe?—No, the greater number do not.

2092. In whose houses do they live?—In the houses of Lord Penrhyn and of the Cefnfaes estate.

2093. The older houses in the district are very small, are they not?—Yes, they are.

2094. Will you describe one of those houses?—There is one large room on the ground floor, with the walls about eight feet high, and one small room, generally called a "chamber," and above that there is a loft.

2095. What is the average number of the families that live in those houses?—They vary a great deal. There is generally the husband and wife and three or four children.

2096. So that they are rather overcrowded?—Yes, they are; but there is a rule now on the Penrhyn estate, I believe, which prohibits that sort of thing.

2097. What is the rule, what number do they allow?—I do not know.

2098. Do you know of any family having been turned out of one of those houses because they are too numerous?—No, I do not, but I know of families who have failed to get houses because there are too many in the family.

2099. How many were there in one of the families you are now referring to?—In one family there are seven, including the husband and wife.

2100. Do you know of any families of five or six who have had one of those houses?—Yes, if the children were of the two sexes.

2101. The houses that have been built during recent years are more commodious, I suppose?—Yes, and they are improving the other houses on the Penrhyn estate as well.

2102. In what way are they improving them?—They do not add to the number of the rooms, but they are re-roofing them, and putting new windows and doors in them.

2103. The old windows in those houses could not be opened, could they?—I am not certain.

2104. Can the new windows be opened?—Yes.

2105. (*Mr. Evans.*) Can you tell us what the length of the Penrhyn Quarry is—the lineal length of the excavations?—I cannot answer that.

2106. Would you say it is 1,500 yards?—Yes, I believe it is about that.

2107. Can you tell us the depth of the quarry just in the middle?—In the middle it is from 250 to 300 yards.

2108. Do you consider that a great length of open space like that is a source of weakness to the rock?—Yes, it is, certainly.

2109. Do you think that the great depth is also a weakness?—Yes.

2110. In order to keep that rock safe, do you consider that the width of the galleries should be two-thirds of their height?—Yes, speaking generally, they should be.

2111. By saying "generally," do you mean that that width would do for all the rocks on the left side of the quarry?—There are some places on the left side where the width and the depth ought to be the same.

2112. Which places do you refer to now?—I refer to the top of the quarry, where it is loose.

2113. What would you say as to the bottom of the quarry, say at Fitzroy?—The rock there is very similar to the rock at the top in regard to brittleness.

2114. What do you think the depth ought to be there?—The depth ought to be the same as the width.

2115. You are talking now about the gray soft slate?—Yes.

2116. What do you consider the depth ought to be?—About two-thirds.

2117. Do you think that would be necessary there?—Yes.

2118. You mean in order for it to be safe for the men who work down below?—Yes, quite so.

2119. You have said that some of those gallerie are very narrow?—Yes, they are.

2120. Can you give us an example of a narrow gallery, and tell us the name of it?—Yes, there are two or three of them on the left side of the quarry, and on the right side.

2121. Confine yourself now to the left side of the quarry?—There is the gallery called the "Level Gallery."

2122. What is the width of that?—There are some places only 9 and 10 feet wide.

2123. Is that in the hard or in the soft rock?—It is in the softest rock in the quarry.

2124. You mean the green wrinkled rock?—Yes.

2125. Can you mention a narrow place in the hard rock?—I have not taken any note of that.

2126. Do you remember the time before the great fall some years ago?—Yes.

2127. Do you remember the year that fall occurred? It is about 21 years ago. I believe it was in 1872.

2128. Do you know what was the width of the galleries in that part of the quarry before the great fall?—Yes, some of them.

2129. You remember the galleries in general on that side of the quarry, before the great fall of 1872?—Yes, I do.

2130. Can you give us any idea as to the width of the galleries where the fall came?—Many of them were only three or four yards.

2131. Were there places where two or three galleries went into one?—Yes, underneath the place where the fall came, at the bottom.

2132. And do you consider that that was the cause of the fall?—Yes, and nothing else.

2133. Was there any of the red slate outside of the fall then, or had it all been worked?—There was a little of the soft rock at the bottom.

2134. But the body of the red rock had been worked away before the fall?—Yes.

2135. I suppose you consider the galleries are better at the present time than they were then?—No, there are some galleries now as bad as they were then.

2136. Do you consider that similar falls are liable to occur?—Yes, and one has just taken place in the same place now.

2137. Do you consider that it requires a great deal of practice and experience to fix upon the proper dimensions of the galleries on the left side of the Penrhyn Quarry?—Yes, that is my conviction.

2138. Do you consider that the two-thirds should be in the width of the gallery alone, or could it be divided between that and the slant?—You must get both.

2139. You consider you must get two-thirds of a flat gallery and the slope besides?—Yes.

2140. How far do you consider that the road could be from the edge of the galleries?—It ought to be two yards where there are men working below, and 4 feet where there are no men working below.

2141. Are you not aware that that is the rule at Penrhyn Quarry, to have the road within 6 feet of the edge?—I have heard so, but I cannot refer to it as being in print anywhere.

2142. And you say they are not so now?—Yes, in a great many places they are not.

2143. Are they 6 feet as a general rule?—If you take from one place and add it to another it might be.

2144. But are the roads generally 6 feet from the edge?—No, they are not.

2145. Do you know of any accidents that have happened through pieces falling from waggons in passing?—I know of an accident owing to the fall of a hand-spike, a thing we use to raise waggons on to the rails. There was a horse drawing the waggons in that case.

2146. Do you consider that the same width will do when a horse is drawing a waggon as where a man is pushing it?—There should be more where there is a horse.

2147. Do you consider that good roads help to prevent such accidents as those?—Yes.

2148. Do you consider that a road should be in good order when men are working down below?—Yes, and even when there are no men working down below if men are employed to push the waggons.

2149. You consider that the bargains should be inspected every morning before the men are allowed to commence their work?—Yes, I believe they should be.

2150. Do you consider that it is the duty of the quarryman to do that himself?—It is his duty, I believe, but I consider there ought to be somebody else appointed to see that he does it.

2151. Who do you mean by "somebody else"?—I mean the officials and a Government Inspector.

2152. You mean that there should be an inspector to see that the officials carry out their duties in this respect?—Yes, that is certainly my opinion.

2153. Do you know that the chains and machinery and so on are inspected daily at Penrhyn Quarry?—I have heard that from the man who attends to those things, but I cannot refer to it as being a printed rule.

2154. Do you know that there is a special inspection of those by a man appointed for the purpose?—No, I do not know that.

2155. Did you ever know that it was so?—No, I do not remember.

2156. Then you cannot say that it is not done at the present time?—I have heard that the son of the chief manager was appointed to superintend the machinery at the quarry, but I cannot say whether that is so or not.

2157. Do you consider that there should be a periodical inspection of all machinery and things of that kind?—I consider that the Government inspector should see to that.

2158. But he cannot be there every day; do you consider that the officials, or someone appointed by them, should do it?—Yes. Those things do occasionally get out of order.

2159. How often do you think the Government inspector should come and see to these matters himself?—In such a large quarry as ours I should think he ought to come round once every two months at least.

2160. In the case of throwing down, do you think that the men who throw down should, in addition to giving warning, see that the men down below have moved out of the way before they throw anything down?—Yes, I do, certainly.

2161. Do you know that there is a rule at Penrhyn that no one is to throw down without giving proper warning?—I believe there was a rule about 10 years ago, as I said before, but I do not think it is to be seen anywhere in print now.

2162. Can you give us any reason for the increase in the number of accidents at Penrhyn Quarry during the last few years?—I can give reasons to my own satisfaction.

2163. But first of all, do you agree that there have been more fatal accidents at Penrhyn during recent years than was the case formerly?—Yes, I believe there have been.

2164. How many fatal accidents have there been at the quarry this year?—Four.

2165. There have been four this year already?—Yes, two in April, one in May, and one in July.

2166. Can you give the Committee any reason for this increase in the number of accidents?—I will give you my own opinion on the matter. During the last five or six years there has been a sudden change in the management. The two chief managers have been changed, and I do not think the new ones are quite so careful about the rules as the men who were there before them. At that time they worked one day a week less than they do at present, and it is possible that that partly accounts for the increase, as we are working more hours per week now than we did formerly. There is also a new way of letting the bargains in the quarry. A piece of rock is let to men, and those men take inexperienced men to help them with the bargain.

2167. (*Mr. Darbishire.*) Do you mean that the contract is let to a practical quarryman, and that he is allowed to take whoever he likes to assist him in the work?—Yes, the men who take the contracts are experienced men, but many of the men they take to assist them are inexperienced, and, as far as I understand, those men are not considered as belonging to the quarry.

2168. Is he required to ask the leave of the manager before taking men to assist him with his contract?—I cannot be certain about that, but I have been told that they are at liberty to take a certain number of men. In some instances it can be proved that the chief manager insists upon seeing the men. Contracts are also let at too low a figure, and the men get reckless, and remain constantly at their work, without even going into shelter at the time of blasting.

2169. (*Mr. Evans*). Can you tell the Committee of any accident that has happened in consequence of those men working with inexperienced men?—Yes, I can refer to two now.

2170. What accidents are those?—Hugh Williams was killed on the 29th April, 1893. He was a contractor himself, and the men from whom the piece of rock came were also contractors. A similar accident happened on the 29th July 1893, at the place from which the rock came that killed Hugh Williams.

2171. In the case of Hugh Williams, if the men gave warning to him, he went to work in spite of that warning?—So they say. That is what I understand from the evidence given before the coroner; but it is said among the men that he had notice that they had finished.

2172. Among what men is that said?—The men who worked about him.

2173. Then as far as you can say he had had proper warning?—Yes, he had. The men who were working with him had gone away, but he went there himself to load slabs.

2174. I suppose you know of cases at Penrhyn where men were killed by stones falling from the galleries above?—Yes, several.

2175. Although the galleries might have been of the proper width?—They were not of the proper width.

2176. Do you remember a man being killed in your gallery who was about 20 yards from the side of the rock at the time he was killed?—Yes.

2177. Then do not you think that that is a very strong reason, whatever may be the width of the gallery, that there should be warning to the men below, and that they should be seen to get out of the way before anything is thrown down?—Yes, no warning was given in that case except when the thing was falling.

2178. Do you think that those who throw down should see that the men have moved out of the way before they throw down?—Yes, I do, most certainly.

2179. There are places in the quarry where there are no men working at the present time?—Yes.

2180. Do you think that those places should be examined periodically where there are men working underneath?—Yes, in some places especially.

2181. With regard to the tunnels, are there some of them very crooked?—Yes.

2182. Do you think there should be a light in all turnings in those tunnels?—Yes, there should be.

2183. Do you say that there is no light at present?—There is some light, but it is not strong enough. The lamps have been put up in places where the wind cannot blow them out, and they do not throw out the light where it is most wanted.

2184. Do you consider that the present mode of blasting at Penrhyn is satisfactory?—Yes, except that they have given up one thing that was useful there.

2185. What is that?—They have given up the signal.

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2186. Do not they use a flag there now?—No, they do not.

2187. Do you consider that the distance from the bell to one end of the quarry is too great when the wind is blowing against the sound?—Yes, it is, but they have a horn there which is blown at the same time as the bell is rung.

2188. So that they use the horn now instead of the flag?—They use the horn because the bell is too far, but the sound is only just the same.

2189. But the horn answers the purpose, I suppose?—Yes, in the place it is adapted for.

2190. Do you think there is any necessity to fence the top of the Penrhyn Quarry all round?—No, unless they want to prevent sheep from falling in.

2191. Do you think it is necessary to put a fence at the bottom?—No, I do not. There is no public path.

2192. You know that a great many visitors go to the quarry in summer. I suppose you consider that they should be warned when blasting goes on?—Yes, but there is always a guide with them.

2193. And is there not a board put up in addition to that?—Yes.

2194. Do you think that that should be done everywhere where strangers may come near to quarries when blasting is carried on?—Yes, I do.

2195. You have said that proper ladders ought to be provided?—Yes.

2196. Have you got proper ladders at your quarry?—They are very good as a rule. I have only seen two ladders that were out of order.

2197. Do you know of any accident that has happened in recent times through bad paths or bad ladders?—I have referred to one accident which occurred owing to a defective ladder.

2198. And was that over 20 years ago?—Yes.

2199. (*Mr. Richmond.*) Have you any ambulance at the quarry?—Yes, there are stretchers.

2200. (*Mr. Evans.*) Where do you get water to drink at the quarry when you want it?—On the galleries, wherever we can find some.

2201. Have you any privies at the quarry?—I do not know of any.

2202. Do you think that the present custom in that respect is injurious to the purity of water?—Everything that is obnoxious in the galleries goes into the water.

2203. Who do you consider should see that the galleries are kept at a proper width?—I think there ought to be three parties.

2204. And who are they?—The workman, the master, and the Government inspector.

2205. (*Mr. Richmond.*) Do you remember the accident to Rowland Jones on the 18th of April this year?—Yes.

2206. Was there any ambulance at hand then?—There was one, but it could not be got hold of at the time.

2207. How was he carried?—It happened at night. He was a miner, and one of two who worked at the bottom of the quarry on a night-shift. They had to go there through the deepest water-balance belonging to the quarry. They had two blasts at midnight, and Rowland Jones was to ignite both. After he had ignited one, he came away without igniting the other, and as soon as the first had exploded, he went back to ignite the second. Just as he was approaching the spot the second ignited from the first, and he was hurt. The man who was working with him put him on his back on a plank, with his coat under his head. He then had to go along the tunnel and climb up the ladders and go nearly a mile to get men out of bed. The man who attended to the water-balance got up and came there, and a few other men came also. Rowland Jones was then carried to the hospital, which was reached about 2 o'clock in the morning. He died there soon after reaching the place. I cannot say how he was carried there.

2208. (*Mr. Evans.*) Do you think that holes ought to be re-opened after they have missed firing?—Yes, I think that might be done if proper care be taken.

2209. Do you think it can be done without risk?—Yes, it can.

2210. Then, how would you do it?—With a kind of a scraper, with a screw at the end of it.

2211. What would the scraper be made of?—Of iron.

2212. But do you think it safe to use iron with powder?—It would not touch the powder at all.

2213. Do you know of any accident at Penrhyn through opening holes in that way?—Yes, with opening holes, but they have not been opened in that way.

2214. In what way were they opened?—With a chisel and a hammer.

2215. What is your opinion as to getting to a blast after it has missed fire?—A man ought not to go near it for half an hour or an hour, in my opinion.

2216. How soon would you re-powder after the first time?—I would not do it within an hour.

2217. Do you think that anyone should be allowed to go near powder when he is smoking?—No, certainly not.

2218. Do you think that he should be fined or punished for so doing?—Yes, by all means.

2219. Do you know of any accidents which have taken place at any of the quarries in North Wales in consequence of that?—I heard of one at Penrhyn some years ago.

2220. And did you hear of one at Festiniog some years ago?—I believe I saw an account of one in the newspaper. I have seen men doing that lately at our quarry.

2221. Do you think anyone should be allowed to fire a blast outside the specified time?—No, unless, it is done officially, and every man in the quarry is made aware of it in time.

2222. I suppose you know that there are stoppers to the cranes at Penrhyn Quarry?—Yes, there are.

2223. Do you think those should be in use everywhere?—Yes, and there should be a break as well to help the man to lower the crane. I think the props should be longer, too.

2224. Do you know of any having broken because they are too weak?—Yes, a great many, but I do not know of any accident having happened on account of that.

2225. Do you consider that if anyone finds a rock which he considers dangerous that he should inform the officials about it direct?—Yes, he ought to do so.

2226. Do you think that any man should be allowed to work in a place which it is suspected is unsafe?—No, they ought not to be allowed to do so. Men do see dangerous places in the quarry, but I do not think they would venture to inform the officials of it unless it is a place that is dangerous to their own lives.

2227. But do you think that a man should keep to himself anything that he knows is dangerous to his fellow-workman?—No, he should not. He ought to inform the workman.

2228. Why should he not inform the officials of it?—He would be afraid, I suppose. (William R. Evans added to the last answer: The officials say that we are not to interfere in the management of the quarry, and if we did inform them they would say that we were interfering.)

2229. Do you know that one of the rules at Penrhyn is that no one is to work under a dangerous rock?—Yes, it is, but as a matter of fact they do work under dangerous places.

2230. Is there any difficulty in approaching the officials to inform them of anything of that kind?—Nothing, only that we would be afraid.

2231. (*Mr. Darbishire.*) You are afraid to speak?—Yes.

2232. (*Chairman.*) Why should you be afraid?—There are two reasons. We are told not to interfere with the management, and another reason is that that

place would be stopped, and that we would be thrown out of work.

2233. (*Mr. Darbishire.*) If you complain you are afraid the officials would say, "Very well, we will stop it"?—Yes.

2234. (*Mr. Evans.*) Do you think that the result of the examination of the machinery and also of the rock where no one is working should be entered in a book?—If anyone is employed to do the work I think his report should be sent in regularly, and that it should be recorded in a book.

2235. And do you think that that book should be produced to the inspector when he comes round?—If there is an inspector he ought to see the book as often as he cares to ask for it.

2236. And are you aware that there are rules for regulating the working of the water-balances and the inclines?—Yes.

2237. Do you think that that should be done everywhere in connexion with machinery?—Yes, when that machinery would be likely to endanger the lives of the men.

2238. And do you think that those rules ought to be put up in the language of the workman?—Yes, and they ought to be put in his hands as well.

2239. (*Mr. Richmond.*) You have said that there are ambulance stretchers at your quarry?—Yes, there are.

2240. Where are they kept?—In the weighing machines and in the joiners' workshops and places of that kind.

2241. Is there a sufficient number of them?—I should think there is. I never heard that there was any scarcity.

2242. Do you know how many there are?—No, I do not. (Robert J. Parry stated: They are very convenient. There are four or five of them.)

2243. And are they used in cases of accidents?—Yes, unless the men can walk.

2244. With regard to the accident in April last, can you say why the ambulance was not used?—I cannot say, unless the places where they were kept were locked, and no one thought of going for the men who had the keys. I should like to say that men ought not to be allowed to work in such places at night unless the man who attends to the water balance is there.

2245. (*Mr. Vivian.*) How many galleries are there in the quarry altogether, do you say?—About 18.

2246. What good or advantage do you see in a Government inspector being appointed to aid in seeing that the bargains are safe each morning ere the men start their work?—The work of the inspector would be to see the book, and see that the officials are doing their work.

2247. But I understood you said the Government inspector could only come once in two months?—Yes, and I think the workmen should be able to communicate with the inspector without going to the officials.

2248. The cause of increase in accidents, you say is the want of practical partners?—Yes.

2249. What do you call a practical quarryman?—A man that has had long experience in the work.

2250. And what do you mean by a man of experience, how many years ought he to work?—A quarryman ought to begin work at a very early age, and work there for years in order to become experienced.

2251. What do you mean by "practical experience," 12 months, two years, or 10 years?—If they are sent to the rocks to throw down they ought to have some years' experience.

2252. But how many years?—They would get experience in four or five years.

2253. You mentioned the case of a man who met with an accident, how many years had he worked at the quarry?—He had not been there long, only for about five or six months.

2254. What was he doing before that?—He worked on a farm.

2255. In what capacity was he working at the quarry?—He was loading waggons.

2256. How many years' experience does a man require in order to understand how to load a waggon?—He wants a great deal of time to learn how to do it properly.

2257. But how long do you think he ought to have to learn how to load a waggon?—He ought to have two or three years.

2258. To learn to load a waggon you say he ought to have two or three years experience?—Yes, to do it properly. He does not know how to handle a brittle stone at first, and one man was hurt lately for that very reason.

2259. To begin with a man must learn how to load a waggon?—He can learn.

2260. But how is he to commence to learn?—By long experience, and by working with those who are accustomed to such work.

2261. Surely you have to learn little by little?—The sooner they begin the better, but some learn after getting into years.

2262. You say the men do not report dangers to the officials?—No, they do not.

2263. And you mentioned certain reasons?—Yes.

2264. Has such a case ever been reported to an official and he has treated the man uncivilly?—There have been instances where men have told the officials of dangerous places, and the officials have replied that that was a question connected with the management of the quarry, and that the men were not to interfere.

2265. What position did that official hold?—He was the chief acting manager.

2266. And how long ago is that?—It was some years ago.

2267. Who was the chief acting manager at that time?—I think Mr. J. J. Evans was one, and Mr. Pritchard after him.

2268. That is when you were told you were interfering with the management, and that you were not to do it?—Yes.

2269. (*Chairman.*) Was the threatened danger removed or dealt with in any way at the time you were told you were interfering with the management?—Yes, I believe they removed the danger.

2270. Then it was attended to, notwithstanding the answer you got?—Yes.

2271. (*Mr. Vivian.*) But the reply you got was that you were interfering with the management?—Yes. That was said with regard to a place where there were no men working.

2272. (*Mr. Darbishire.*) In saying that you are afraid to report a dangerous place to the management, do you mean that you are afraid to report a place that you are working at yourself as dangerous?—No, certainly not.

2273. (*Mr. Evans.*) Can you refer to the place and time when you say I stated that you were not to interfere with the management when you pointed out a dangerous place in the quarry?—I do not remember the day or the year.

2274. About when was it?—We were before you as a deputation from the men, and I said there were too many working on a certain place in the quarry, and asked you to send them away and put rubellers there, and send the others to the top of the quarry.

2275. Where was that?—The top of the left side of the quarry.

2276. Was that the place that you wanted to shift the men to?—We wanted them removed from the places called "Jolly Fawr" and "Bonc Level" to the top of the quarry.

2277. Can you tell me what year that was?—It was the time they were dismissing men because the stock of slates at the quarry was so heavy.

2278. But when was that?—I do not remember. It was put before you as the desire of the committee on behalf of the men, and you were asked to do that rather than dismiss the men.

2279. Then that was a proposal to keep the men instead of discharging them?—Yes

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2280. But that was not in consequence of any dangerous rock, was it?—We saw that they were taking the good rock away, and that the consequence would be that it would fall like the other place before that.

2281. But according to your answer just now it was so as not to send men away?—That was our object in going to see you, but the other matter turned up in the course of the conversation.

2282. Was that the object you had in view when you started?—No, our object was to try to prevent the men being turned away.

2283. Did you tell me that the place was unsafe?—Yes, and it was then that you said we were interfering with what we had no right to, but you said you sympathised with the men at the same time.

2284. How long ago were those places, "Jolly Fawr" and "Bonc Level" stopped?—Some of them have not been stopped yet.

2285. Are you not aware that those places have been stopped for many years except to lighten them?—Yes, some places.

2286. Do you know that the soft rock is stopped in them?—Yes, in some places it is.

2287. Not all of them?—No, they are working there to-day.

2288. Is there any soft rock in "Twll Dwndwr"?—Yes.

2289. Where is it?—Close to that fall.

2290. Are you sure of that?—Yes, quite sure.

2291. Is it stripey?—There is some still, but a great fall came down lately.

2292. (*Mr. Vivian.*) What is the official staff at Penrhyn?—There are about 12 agents, from Mr. Young downwards.

2293. Is there an overlooker and a sub-overlooker to each department?—(No answer).

2294. Are they divided into departments?—Yes.

2295. What officials are there?—The overlookers and the setters, and Mr. Pritchard to superintend them all.

2296. Who is there below Mr. Pritchard?—The bargain setters.

2297. And who next?—The overlookers.

2298. And who else?—There is no one else.

2299. Are you prepared to say that the officials do not each morning make an examination so far as is practicable in their various departments?—No, I am not aware.

2300. Are you prepared to say that they do not do so?—Do you mean that they do that before we commence to work?

2301. No, whenever they come in the morning?—I do not know what they do then except see that we are at our work.

2302. But you are not prepared to say that they do not do it?—They come there, but I do not know what they do.

2303. By that you mean that there are certain men who do not look at their bargains before they commence to work?—Yes, I do.

2304. You say men are reckless enough to work at their bargains before looking at them?—Yes, I am sorry to say that is so.

2305. Do you consider that more accidents occur in the morning directly after the men commence work than at any other time during the day?—No, I do not think so.

2306. You consider they are less?—That is what I believe now.

2307. You consider they are less in the early morning than later on in the day?—I only remember a few who have been hurt early in the morning, but there are a few cases.

2308. What are the accidents you refer to as having taken place early in the morning?—They have been owing to falls, and to men falling over without knowing that the place had gone down.

2309. (*To Robert J. Parry.*) What is your experience as to accidents happening in the morning?—I cannot refer to anything special, but I believe they are quite as liable to accidents later on in the day.

2310. (*To William R. Evans.*) And what is your opinion?—As a rule they meet with accidents in the afternoon.

2311. (*To Hugh H. Davies.*) Can you refer to any accidents that have occurred in the tunnels owing to want of light?—Yes.

2312. What are they?—One man named Robert Parry fell down in the loom.

2313. When was that?—About 5 or 6 years ago.

2314. Was it a fatal accident?—No.

2315. Was there water in it?—No, no water remains in it.

2316. What tunnel did that occur in?—In the Lord level.

2317. And what is the length of that level?—About 150 or 200 yards.

2318. How many men pass through that tunnel daily?—There are about 200 men working there, and many of them go backwards and forwards throughout the day.

2319. Are there 1,000 men who go through every day?—No, perhaps there would be 500.

2320. Or would there be 600?—Yes, there might be.

2321. How many levels are there with water-balances?—About six.

2322. Can you say how many accidents have happened owing to there being no fencing at the bottom of the water-balances?—I have named one already.

2323. How many more do you know of?—I know of two or three in the same water-balance.

2324. How long ago is that?—It was many years ago.

2325. And did that occur through want of fencing?—Yes.

2326. How many years ago is it?—About 10 or 15 years ago.

2327. Is there not sufficient light from the top?—No, there is not, in those that are deep.

2328. (*Mr. Evans.*) Do any of you work in that level?—(*Jeremiah Thomas answered:* I do.)

2329. (*To Jeremiah Thomas.*) Is there no fencing at that shaft?—No, not at the bottom.

2330. (*Mr. Vivian to Mr. Hugh H. Davies.*) How long ago is it since the undermining you have referred to?—It was recently that the fall came down, but there was some rubbish in the place before that.

2331. You say there was undermining, and that the place was dangerous on account of that?—Yes.

2332. Is this undermining on the increase or decrease at the Penrhyn Quarry?—It seems it is on the increase. One fall came down on the 9th of last month.

2333. You say it is on the increase?—Yes, I do. That is how I account for that fall.

2334. You say 12 inches to 3 feet was the distance from the rail to edge of the gallery?—Yes.

2335. Did you take the outside rail of the tramway in that measurement?—Yes, and I took the measurement last Saturday.

2336. That was in certain portions of the gallery?—Yes.

2337. Possibly from one to two yards long?—Yes, that is so.

2338. How many of those narrow places are fenced?—There is not one of those 14 places that I have referred to that is fenced.

2339. Do you mean 14 galleries or 14 places?—There are 14 places.

2340. Are there 14 places in 14 galleries, or 14 places throughout the whole quarry?—There are 14 galleries, but there are 16 places in those 14 galleries.

2341. And the length you say of each gap varies from one to two yards?—Yes.

2342. And none of these 16 places are fenced?—No, there were a great many places that were fenced in those galleries, but I have not counted those places. I have only counted the places that were not fenced.

2343. And you say not one of those 16 places was fenced?—No.

2344. Has any accident ever occurred at these narrow places which are unfenced?—I only know of one myself.

2345. What was that?—A man fell off. It was not the ordinary tramroad, but a kind of branch to go to a certain place.

2346. To go to his bargain?—No. He was just going to the siding so that another might pass, and when he was going back he fell over the gallery.

2347. Was he killed?—Yes, the branch was on the edge of the gallery, and he fell over.

2348. Is that one of the narrow places that you have been speaking of?—No, that was some years ago.

2349. What was the man's name?—Evan Williams.

2350. Was that in 1887?—Yes, I think it was.

2351. Do you know of any single accident that has occurred at any one of those 16 narrow places?—No, I do not.

2352. Do any of your three friends?—No, they do not. (Robert J. Parry added: We do not know anything about the figures that Davies has given, as he went there alone.)

2353. (*To Hugh H. Davies.*) Do you not consider that at the Penrhyn Quarry the roads are shifted back when it is practicable?—There are some cases where they do not do it, and they ought to do it.

2354. Has attention been called to it by the men?—I cannot say whether that has been done.

2355. You do not know whether attention was called to it or not?—No, I do not.

2356. Are not the galleries 12 yards wide as far as practicable?—No, they are not.

2357. (*Mr. Darbishire.*) What is the difficulty in walking along the tunnels which you wish to provide for by having more light?—Sometimes elderly men who cannot see very well go there, and the place is full of waggons at times. There is very often smoke and mist in the tunnel, so that one cannot see.

2358. Do the men hurt each other under those circumstances?—There have been instances of that. (Jeremiah Thomas added: About the dinner hour the labourers bring their waggons, and let them run on to the tunnel, and there they stop. Then when the men come for their dinner they go against the waggons, which very often are standing in a dark place in the tunnel. I consider there ought to be more light in the tunnels.)

2359. (*Mr. Darbishire to Jeremiah Thomas.*) Did you ever complain about the men leaving the waggons in the tunnel?—I do not know that we have been complaining to the officials, but we have been complaining to each other. I would like to refer to the rocks where no one is working. The officials do examine them, and if they see that there is any danger they send men to clear them. With regard to the rocks upon which we are working, if they see anything dangerous they will tell us, or they will send us to clear it. If it is a poor rock we are not very willing to go there without getting a re-letting, and on the other hand the officials are not willing to do that.

2360. (*Mr. Evans to Hugh H. Davies.*) There are two tramway lines there, are there not?—Yes.

2361. One for the empty waggons and one for the full?—Yes.

2362. Is it the rule that the men always work on the right hand side each way?—No, they take the left hand side.

2363. Are you sure of that?—Yes.

2364. In going out of the quarry the full waggons are on the left?—Yes.

2365. Is it a rule that the men in going up from the galleries take the waggons with them if they can?—The rubbishers take their dinners down at the bottom.

2366. And so they do not take their waggons there?—No, only to the level.

2367. Do they eat near the bottom of the shaft?—No, on the gallery.

2368. Then they go up themselves and leave the waggons at the bottom?—They go back to the gallery.

2369. (*Mr. Darbishire to Jeremiah Thomas.*) Is the dangerous place that you spoke of left alone?—Yes, unless we are compelled to go to it.

2370. But if it is dangerous, are you not compelled to go?—Yes, very often.

2371. They tell you that you must remove it?—Yes, and we argue that we ought to get a re-letting on the place.

2372. As a matter of fact, do you not get a day allowed to you for doing that kind of work?—Yes, but not in every case. We are much more willing to work in dangerous places than the officials are to allow us to do so.

2373. (*Mr. Williams to Hugh H. Davies.*) You were asked whether they do not make the galleries 12 yards wide as far as practicable?—As far as my opinion goes they do not make them, but they may not be of the same opinion as me as to what is possible and what is impossible.

2374. Is it possible to do so in the Penrhyn Quarries without taking years to do so?—Yes.

2375. How could they do it?—By removing the roads and cutting the heels.

2376. You say there are 18 galleries in the Penrhyn Quarry, and that the height is from 200 to 300 yards, if you allow 12 yards for every one of those 18 galleries what would be the distance from the top to the bottom?—I cannot answer that question, I am not enough of an arithmetician.

2377. Are you not wrong in the answer you gave just now that they could do it without waiting for years?—Yes, I am. I thought you were referring to the narrow places. I believe it could be done, but I do not know how many years it would take. (Robert J. Parry added: In my opinion it could not be done in less than fifty years.) (Jeremiah Thomas remarked: When a piece of rock comes down from one gallery to another, and there is no accident, there is no proper inquiry to find out who has thrown it unless it does some damage.)

2378. (*Mr. Evans to Jeremiah Thomas.*) Does that kind of thing happen often?—Yes, pretty often.

2379. (*Mr. Darbishire.*) Does not the man who works below let the man above hear of it?—No, not if everything passes without any harm being done.

2380. (*Mr. Vivian.*) Do you not take any notice of it at all?—Very little.

2381. If a piece came near you what would you do?—I would only try to get out of the way.

2382. (*Mr. Evans.*) Would you recommend that there should be a special rule on the subject?—Yes, there should be.

2383. (*Chairman to Hugh H. Davies.*) Have you simply stretchers at your quarry, or are there bandages and splints and so on provided?—There are men who have been in the ambulance classes, and sometimes they have things of that kind with them in their pockets, but there is nothing kept officially, as far as I know.

2384. There is nothing kept at the quarry but the stretcher?—I am not aware that there is anything else.

2385. Are there many men employed at these quarries who have received ambulance instruction?—Yes.

2386. About how many are there?—I cannot say the number.

2387. Is there a course of lectures going on there now, or has it been given up?—They are not given in the summer, but they are in the winter months.

2388. Are they given every winter?—Yes.

2389. And you say there are four stretchers kept at the quarry?—Yes.

2390. Are they all kept locked up?—No, not in the daytime, and I think there are more than four.

2391. Who keeps the key of the place they are kept in?—The man who is at the place.

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2392. When the man was injured at night where was the key of the ambulance kept?—I do not know.

2393. (*Mr. Evans.*) This stretcher was kept in the joiners' shop by the water-balance, I suppose?—Yes, and there is another kept by the machine.

2394. (*Chairman.*) Has there been any alteration either in the mode of dressing or in the sheds themselves during the time you have worked there?—The only thing they have done with the sheds was to raise the roofs a little higher. The sheds are very cold in the winter, as they are not properly built, and that affects the health of the men very much.

2395. Are those the dressing sheds?—Yes.

2396. Are you in the habit of working in the dressing sheds?—Yes, I have worked there for the last 30 years.

2397. Do you consider yourself a fair sample of what the slate-dust can do?—I had very good health for years, and I was very strong as a boy, but during the last few years I have been suffering in health.

2398. With regard to the tunnels, what is the distance between the rail and the side of the tunnel?—They vary.

2399. Can a man stand between the side of the tunnel and a waggon that may meet him?—No, he cannot.

2400. Are there any refuge holes?—There are places the man can go into.

2401. The full waggons and the empty ones are in the tunnel at the same time?—Yes.

2402. And they pass each other in the tunnel?—Yes.

2403. And there are no places at the side where a man can get into?—No, but there are places that can be used.

2404. How are the waggons sent along?—They are pushed by men.

2405. There are no horses?—No, not in those tunnels.

2406. Have there been any accidents in those tunnels?—Yes.

2407. Which do you consider to be the most prolific source of accidents in the quarry, so far as you know?—The chief causes of the fatal accidents are men falling over the galleries, and stuff falling upon them.

2408. And does the same answer apply to the non-fatal accidents?—Yes.

2409. You consider the same causes are the source of the most accidents in both cases, the fatal and non-fatal?—There are several which happen otherwise.

2410. But those are the main causes of accidents, you think?—Yes.

2411. During the actual time of working in the quarries, are the men who are working there not the best judges of whether the place is safe or not?—Yes, those who work on the place can say best.

2412. Are those who work in the galleries in more dangerous places than those who work outside?—Yes.

2413. Can you give us an estimate of the number of men at the Penrhyn Quarries who work inside on the galleries, and those who work outside?—There are one-third outside in the huts.

2414. And two-thirds inside?—Yes.

2415. (*Mr. Vivian.*) How do you arrive at that proportion?—We have been thinking over it, and making an average of it, but we cannot be quite certain of the figures. Some of them work part of the month in and part of the month out. I should like to say with regard to the sheds that the walls ought to be plastered.

2416. Is not that done at Penrhyn?—No, they do not. With regard to two of the accidents I have referred to, the attention of Lord Penrhyn has been called to them, and he has stated that no expense will be spared in order to save the lives of his workmen. I should like to add that we, as workmen, consider that a Government official should be present at all inquests upon men who have met with accidents at the quarries.

Jeremiah Thomas added:—"With regard to the increase in the number of accidents at the Penrhyn Quarry of late years, in my opinion that increase cannot be put down to anything in particular.

2417. (*Mr. Evans to Jeremiah Thomas.*) Do you think there were any accidents amongst them which could have been avoided?—Some of them might have been avoided if contracts were not let at too low a figure. That sort of thing compels men to work regardless of danger.

GRIFFITH WILLIAMS, and JOHN J. PARRY, employed at the Glanrafon Slate Quarry, were called into the room together.

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GRIFFITH WILLIAMS examined.

2418. (*Chairman.*) How long have you worked at the Glanrafon Quarry?—I have been there for 12 months, and Parry for about 14 years.

2419. Are you both quarrymen?—Yes.

2420. You are aware that this is an inquiry into the dangers to which quarrymen are liable?—Yes.

2421. What dangers do you think you are specially subject to?—To falls of rock.

2422. Have you seen any accidents through blasting?—There was one caused by a lump from a blast striking a man.

2423. Was that a stone which fell after blasting?—No, it was a lump which was thrown by the blast.

2424. Are there any shelters at your quarry for blasting time?—Yes, there are tunnels for the men to go to, and there is a shelter shed at the upper gallery.

2425. In the case that you have referred to, was the man not in the shelter?—There was no shelter shed at that time in the quarry. He went to a corner where he thought he was safe. He and others who were with him thought it was safe.

2426. Are you speaking of an accident which took place nine years ago?—Yes, it would be nine or ten years ago.

2427. Was Evan Williams the name of the man?—Yes.

2428. You say there was no shelter there at the time?—There was no hut there at the time.

2429. It has been erected since then?—Yes.

2430. How long has the shelter been there?—It was built soon after that accident.

2431. Is your quarry worked in galleries?—Yes.

2432. What width are the galleries?—They are different widths, and in some parts they are very narrow.

2433. What do you say the width is?—In some places it is only 2 yards.

2434. The whole width of the gallery is only 2 yards?—No, that is the width in some parts of the galleries where the roads come from the bargains.

2435. Can you say what is the general width of the galleries?—It differs.

2436. Do you mean that it is 2 yards wide where it leads to the bargains?—Yes.

2437. And does anybody work underneath the place where it is 2 yards wide?—Sometimes, when the side is giving way.

2438. In the working places the galleries are wider?—Yes, they are much wider.

2439. How close to the edge of the gallery are the rails of the tramways?—They vary in consequence of the narrow places. They are obliged to shift them backwards at times.

2440. But how near to the edge are they as a rule?—In some parts, where the gallery is narrow, they are within 2 feet of the edge.

2441. And is that the narrowest place?—Yes.

2442. (*Mr. Darbishire.*) What is the width of the working places at the top floors?—At the entrance they are 20 yards wide, but as they go forward they become narrower.

2443. (*Mr. Richmond.*) How many galleries are there?—There are five including the lower sink.

2444. And you are referring to the galleries that are above the sink?—Yes.

2445. Have you had accidents from stones falling from one gallery to another?—No, not so much of that, but I have seen a waggon fall over under its own load, but as the men called out the men down below were able to get out of the way.

2446. When did that happen?—It was a few years ago.

2447. How many years ago?—About four perhaps.

2448. Do you recollect two accidents, one in April 1889 and the other in April 1890?—Yes, I remember those.

2449. They were both fatal?—Yes.

2450. Do you remember William Edwards?—Yes.

2451. A piece of rock fell upon him?—Yes, from a joint in the rock.

2452. And on the 30th April 1890 Griffith Parry was killed?—Yes.

2453. Some rock fell from the gallery?—Yes.

2454. How did that accident happen?—They were working on the top, but there was a gallery above them. There were blasts which had made the rock loose, and they were obliged to pull it down. They put a stage in front of the rock so as to have another blast, but the rock came down just at that time.

2455. Without any shot being required?—Yes.

2456. And were the men on the stage?—Yes. One of the men found out in time that the rock was coming down and he was able to get clear of it, but the other man was killed.

2457. Have you anything to suggest with the view to reducing the number of accidents at your quarry?—One very important thing is that the most experienced men should be put to work on the rocks. A great many inexperienced men are allowed to work there, and we do not think this should be allowed. Many men go there from the farms round about, and soon call themselves rockmen and quarrymen.

2458. Is there anything in the arrangements as to the galleries or the rules as to blasting that you could suggest an improvement in?—There are no printed rules as to blasting, but it is carried on very regularly.

2459. Do you blast at fixed times at your quarry?—Yes, every hour.

2460. Are signals given at blasting time?—Yes, a horn is blown.

2461. You say there are no printed rules as to blasting?—No, none, but there are rules which are understood.

2462. Do you have two signals given to you, or how many?—We have three.

2463. At what intervals, what time is allowed between each?—Three minutes are allowed between the first and the second, and two minutes between the second and the third.

2464. That is five minutes between the first signal and the last?—Yes, and if we ask for more it is granted.

2465. What do you think ought to be the distance between the outer rail of the tramway and the edge of the gallery?—It is very difficult to say. In one case that I know of a waggon tipped over and threw a young man down, but it happened that the gallery was not very steep there.

2466. Is 3 feet sufficient between the outer rail and the edge of the gallery, do you think?—I think it would be sufficient to pass a side where there is no one working down below.

2467. But where men are working underneath, what distance do you say should be allowed?—I think that 4 feet would be sufficient. (John J. Parry added: I do not think that 4 feet would be sufficient.)

2468. (*Chairman to John J. Parry.*) What do say would be sufficient?—Three yards.

2469. You have shelters provided at the quarry?—Yes.

2470. Are they always used by the men during blasting time?—Yes.

2471. Always?—Yes, they are.

2472. And are the ropes always used on the face of the rock?—Yes.

2473. (*Mr. Vivian to Griffith Williams.*) What do you call "inexperienced men"?—A man when he goes to the quarry first is put to carry rubbish first of all, and then he tries to work himself up to be a quarryman.

2474. You would call that man a waggoner, would you not?—Yes, but after working for three or four months in that capacity he tries to get a place for himself in the quarry, and he very likely gets it.

2475. What kind of a place?—A bargain for himself.

2476. And does he get it?—I have seen that sort of thing.

2477. How long ago is it since you saw that sort of thing?—We have often seen it when the slate trade was going well.

2478. Last year, or the year before, did you see that sort of thing?—(No answer).

2479. Can you name any single case this year or last year of that kind?—No, I cannot point to anything during that period.

2480. As regards the inexperienced men, can you quote one single accident occurring more to these so-called inexperienced men than to inexperienced men? Accidents are things that cannot be foretold, but I think I can refer to accidents which would not have happened if the men had acted properly.

2481. Can you quote one single case of accident to inexperienced men?—I can refer to one at the Penybryn Quarry.

2482. And were you working at that quarry at the time?—Yes, I was working there for 18 months. The man I have referred to refused to do what an experienced man advised him to do, and he was killed in consequence.

2483. How long had the inexperienced man been there, I mean this man who was killed?—I cannot say. When I was at the quarry as a rubeller he was a labourer there.

2484. And how long ago is that?—I cannot say exactly.

2485. But tell us as near as you can?—It is about 13 or 14 years ago.

2486. (*Mr. Darbishire.*) Did you see that accident yourself?—I was on the spot at the time.

2487. And who was the experienced man who advised him to do a certain thing?—There were many who told him the same thing. One of the men was Richard Jones, Caergof, and he was killed himself after that.

2488. Who was the proprietor of the quarry at the time?—I think it was William Herbert, but I am not sure. I was there with William Davies before that.

2489. (*Mr. Vivian.*) How long had the inexperienced man been there from the time you remember him there first until the time of the accident?—About 16 years.

2490. So that in 16 years he had gathered no experience?—He had not been a bargain-taker during the whole of that time.

2491. (*Mr. Williams to John J. Parry.*) You work in sheds or mills at your quarry?—Yes.

2492. What is their size?—From 80 to 100 yards.

2493. Is there a great deal of dust in them?—Yes.

2494. Are there any ventilators at the top?—Yes.

2495. Were they there originally?—Yes.

2496. I suppose the saws turn in water?—Yes, they do.

2497. And that does away with a good deal of the dust?—No, it does not prevent the dust rising.

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2498. Is there more dust in that mill than there was in the old way of working in sheds?—Yes, a great deal more.

2499. Do you think the men feel the effects of it?—I believe they do—myself, at any rate.

2500. You rather hesitated when you were asked about the width of your galleries; you said that in one place it was not more than two yards, is that so?—Yes, that is quite correct.

2501. And are there a great many waggons passing over that place?—Yes.

2502. Are there men working below that?—No, not in those places.

2503. Do they put anything to protect those places?—Yes, they put planks and so on in the turnings. They do as much as they can, I believe.

2504. You must remember that the road is about two feet, and the waggons project another foot over it, so that it does not leave much space?—Those are only in the turns, before they enter the gallery proper.

2505. (*Mr. Vivian.*) Therefore there is no one working underneath?—No, there is not.

2506. You have barracks in your quarry, have you not?—Yes.

2507. How many are there?—Four.

2508. What kind of places are they?—One is a very large place, with about 10 beds on each side.

2509. Is there any partition between the beds, or are they all open?—They have been made into rooms.

2510. Where do they get their meals, the men who live in those barracks?—They have tables along the floor. The bedrooms have doors to shut them up.

2511. Who goes there to clean them up?—A man goes there to attend to that.

2512. Where do they eat, in what room?—In the middle of the place, but the bedrooms are closed up.

2513. Then they eat in the same building?—Yes.

2514. But not in the bedrooms?—No.

2515. Do the men pay for living there?—Yes.

2516. How much do they pay?—It was 4*s.* a month at one time, but I think it is a little less now.

2517. What do they get for that 4*s.* besides the room?—They get a fire, and a man to look after the place. There are women who go from Rhyd Ddu to wash the bed-clothes and so on.

2518. Is the place kept clean?—Yes.

2519. How much do you say is paid now?—I cannot say from my own knowledge. I believe a slight reduction was made some time ago.

2520. (*Mr. Williams.*) A great many of the men go and come daily by rail?—Yes, about 140, I believe.

2521. From Waenfawr?—Yes, and Rhostryfan and Dinas.

2522. And they make an arrangement with the Narrow Gauge Railway Company?—Yes.

2523. Do you know how much they pay the Railway Company?—8*s.* a month.

2524. They do that because they have houses in these villages, and there are no houses near the quarry?—No, there are not, except the barracks.

2525. How do you do on a wet day, are you obliged to work in the rain at your quarry?—No, we are not. The quarry is on a very high level.

2526. Then you are allowed to go home if it is very wet?—Yes, and that is a matter that causes us a good deal of inconvenience, as we are not always able to get a train.

2527. But those who live in the barracks can go there?—Yes.

2528. And there is nothing against you going in?—The men who lodge in the barracks claim it, and the other places are very poor.

2529. What kind of places are they?—The shed, and it is a most unfit place for a man to go after getting wet in the morning, and to stay there throughout the day;—it is a draughty place,

2530. Where do you get your meals, those of you who go home daily?—In the shed mostly, but a few of us are allowed to go to the machine.

2531. Have you a fire there?—No, that is the great drawback.

2532. Then you have no place to warm your food anywhere?—The man in the machine boils the water for the men, and they get their food in the huts where they can find room.

2533. Then there is no proper place appointed for the men to take their meals in?—No.

2534. Do you think there should be a place provided?—Yes. I do not think there has ever been any request for such a place to the proprietors, but there is a general desire among the men for a place.

2535. But you say they have never asked for a place?—No, they have not.

2536. Do not you think you ought to ask?—Yes.

2537. How much time are you allowed in winter for your meal in the middle of the day?—Three quarters of an hour.

2538. At what age must a man go to the quarry in order to become an experienced man?—He must go there as a boy.

2539. You think he will never learn properly unless he goes there very young?—No, he will not. A man after reaching 35 or 40 years of age can never become experienced.

2540. Do you know of any man who has learned the trade of a quarryman, who has been able to learn it properly after passing 20 years of age?—No, never, and he can never do it.

2541. But there are some men who try to work upon the rocks after passing that age?—Yes, a great many, after reaching 35 and 40.

2542. (*Mr. Darbishire.*) Do you know of men who have gone to the quarry at the age of 35 or 40, who had never been at a quarry before, and who tried to begin as quarrymen?—Yes, a great many.

2543. How many?—I cannot say.

2544. (*Mr. Williams.*) You know of labourers who commenced to work there after reaching 20 years of age?

2545. And you know some of those who tried to work on the slate rock?—Yes, I do.

2546. Do you think that they have ever learnt as well as those who begin when they are young?—No, they cannot possibly.

2547. Is it an advantage or a disadvantage to the proprietors of the quarry to allow such men to work on the rocks?—I should think it is a great loss.

2548. Do you consider it dangerous employment for a man who is not a practical man?—Yes, and to the men who are with him as well, if they are younger than he is.

2549. Is it a fact that minor accidents happen to men that are inexperienced?—Yes, that is very often the case.

2550. (*Mr. Richmond.*) Do you both work on the rock?—I have worked on the rock for the last 15 years.

2551. At what age did you begin yourself to work on the rock?—I was about 19.

2552. Were you experienced then, when you first started on the rock?—I ought to be.

2553. But were you experienced at that time?—I had worked for years with old experienced quarrymen, and had seen plenty.

2554. (*Mr. Vivian.*) What were you doing before you were 19?—I was working by the day for the bargain men.

2555. That is the experience they all gain, is it not—it is the usual routine of work?—Part of the month I was working on the rock.

2556. But is not this the ordinary routine in order to gain experience?—Yes.

2557. (*Mr. Evans.*) You have tunnels at your quarry?—Yes.

2558. Are they crooked or straight?—There is one of them crooked.

2559. Is there any light in that tunnel?—Yes, they are lighted all through.

2560. There is no danger in passing through them backwards and forwards?—I have not seen anything happen there at all.

2561. Are you satisfied that everything that can be done to prevent accidents is done, or is there anything you can suggest?—We want more care, and more authority to command obedience to the rules. We also want experienced men, as the quality of the rocks differs so much.

2562. Are your officials experienced men?—Yes, they are practical men.

2563. Then what do you mean by saying that you want experienced men?—The great drawback is that the most experienced men do no take any notice of any man's bargain but their own.

2564. But you said you wanted experienced men, and you say that the officials are experienced, what more do you want?—We want one to look after them all.

2565. Do you mean a Goverment inspector?—I think that would be the right thing, if sufficient authority were vested in him to compel obedience to the rules.

2566. (*Mr. Vivian.*) What do you mean by the term "labourer"?—A man who has never learnt any trade.

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2567. But who are the labourers you are now referring to, do you mean the waggoners?—Not always, because you will sometimes find a quarryman with the waggons. I mean men who have come from farms or other places, and who have never been working at a quarry before.

2568. How long had those men you referred to been at the quarry before they were put to work on the rock?—I cannot answer that. The time varies.

2569. Can you quote a single case at the quarry where you are now working where men who came yonder as labourers have been put to work on the rock?—Yes, a man named Griffith Parry, who was killed there.

2570. Was that at your quarry?—Yes, he was a labourer there.

2571. And when did that happen?—About three or four years ago.

2572. (*Mr. Richmond.*) That was in 1890?—Yes.

2573. He was killed by rock falling on him?—Yes.

Robert Hughes and Hugh Jones, employed at the Lower Glynrhonwy Quarry, and John William Thomas and John W. Jones, employed at the Upper Glynrhonwy Quarry, were called into the room together.

Robert Hughes examined.

R. Hughes, &c.

2574. (*Mr. Richmond.*) How long have you been employed at the Lower Glynrhonwy Quarry?—Five years this last time. I have been working at other quarries.

2575. How many years have you worked as a quarryman altogether?—For 42 years.

2576. (*To Hugh Jones.*) How many years have you worked at Lower Glynrhonwy Quarry?—For eight years.

2577. (*To John William Thomas.*) And how many years have you worked at the Upper Glynrhonwy Quarry?—Nearly all my lifetime. I have only been away from there for a year or two.

2578. About how many years have you been there altogether?—Over 30 years.

2579. (*To John W. Jones.*) How many years have you worked there?—For 20 years.

2580. (*To Robert Hughes.*) Is your quarry worked in galleries?—Yes, there are three galleries and two sinks.

2581. (*To John William Thomas.*) How many galleries are there at the Upper Glynrhonwy?—There are three galleries and three sinks.

2582. (*To Robert Hughes.*) You have a tunnel running into the gallery?—Yes.

2583. And it is rather long, I believe?—Yes.

2584. Can you tell me what is the length of it?—It is about 200 yards.

2585. Is that tunnel lighted at all?—Yes, there is the light which comes in through the shaft.

2586. And the waggons are drawn by steam?—Yes, they are.

2587. Is there sufficient light, do you think?—Yes, there is.

2588. When the engine is at one end of the tunnel, and coming through, can you see at all?—Yes, we can see.

2589. But does not the engine block the light almost entirely?—Yes, the smoke makes it difficult for us to see.

2590. What are the widths of your galleries?—In one gallery it is very wide.

2591. You know that the object of this inquiry is to discover whether there is any remedy for the dangers to health, life, and limb in quarries?—Yes.

2592. Have you anything to suggest which should be altered at your quarry?—With regard to the tramroad on the top, the distance between the rails and the side of the gallery is too short.

2593. What is the distance at present between the outer rail and the edge of the gallery?—There is hardly 18 inches in some places. If a lump fell from a waggon it would go over.

2594. What you suggest is that the space between the outer rail of the tramway and the edge of the gallery should be greater than it is now?—Yes, it should, certainly.

2595. Have you anything to suggest with regard to blasting?—No, I do not think I have.

2596. Have you proper shelters provided for you at your quarry?—There is nothing specially prepared, but at the bottom we go to the tunnel.

2597. And are there any shelters on the galleries?—There is a kind of a shed for the engine, and we go there. I doubt if it is a very safe place, if a lump were to come close by.

2598. Then you suggest there should be proper shelters?—Yes, we have been suggesting that.

2599. Who did you suggest it to?—To Mr. Roberts, the manager.

2600. (*To J. W. Jones.*) Have you anything to suggest with reference to your quarry as to the blasting, or shelters, or the galleries?—It is the custom in our quarry now to blast when the men are leaving work in the evening, and I do not consider that that is a thing that should be allowed. I think they ought to blow at 5 o'clock, so that we might blast at that hour. I believe it is very dangerous to blast at the time the men are leaving their work, and when they are passing the place where blasting is going on. I myself was nearly killed quite recently by lumps which came from the place where they were blasting.

2601. Have you any fixed periods during the day for blasting?—Yes.

2602. (*Mr. Vivian.*) How long has what you complain of been the practice?—For some years.

2603. Have you ever mentioned it to the manager?—We have been complaining to the manager at the quarry. It is not so customary at the Upper Glynrhonwy.

2604. (*To Robert Hughes.*) Have you ever complained of this at your quarry?—I have not heard of

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any complaints, but I know that they do blast when men are leaving their work.

2605. (*Mr. Richmond.*) And the Upper Glynrhonwy men in leaving their work are in danger from the blasting at the Lower Glynrhonwy?—Yes, there is no doubt it is dangerous.

2606. (*To J. W. Jones.*) Have you places to shelter at blasting time?—Yes.

2607. (*To J. W. Thomas.*) How far are the outer rails from the edge of the galleries?—They are only three or four inches at some places.

2608. Is that a fall?—No, a slant in the rock.

2609. And are there men working below that?—Yes.

2610. Have you anything to suggest with regard to that?—That ought to be improved, certainly.

2611. How ought they to be improved?—After they go a little further on they have made holes in the rock, and they build on it, and I would suggest that they do the same at the narrow places.

2612. (*To Robert Hughes.*) Have you anything else to say?—There is only one bargain under that dangerous place in our quarry. The reason why they are carrying on in the narrow place is that they are proving the rock below, and if they can find that there is good rock there they will remove it. The man who is with the waggon always calls out to the men who are working below so that they may get out of the way.

2613. (*Mr. Vivian.*) How many of those narrow places are there in your quarry?—There is only that one place.

2614. (*To John W. Thomas.*) And how many are there in your quarry?—I am only certain of two myself.

2615. (*Mr. Richmond to Robert Hughes.*) Have you had a fatal accident at your quarry within the last 10 years, as far as you know?—No, we have not.

2616. Do you remember a man named Robert Griffith?—Yes, I do.

2617. Was he killed by being struck by a rock?—Yes.

2618. In 1884?—Yes, about that time.

2619. Where did that happen?—At the Upper Glynrhnwy Quarry.

2620. (*Mr. Evans to John W. Thomas.*) There have been a number of men killed at the Upper Glynrhnwy Quarry?—Yes.

2621. Will you say how those men met with their accidents?—Robert Griffith was killed by a piece of rock falling and hitting him on the head.

2622. Where did that piece of rock come from?—Right above his head.

2623. Was that rock hanging over, or how was it?—No, that was not hanging. It was a loose piece.

2624. What made it loose?—They were blasting there at the time.

2625. And was he working at that very spot?—Yes.

2626. What was the cause of the other accident?—Pierce Griffith was the name of the other man. He was throwing a piece of rock in a very inconvenient place. There were two of them working together, and he had been at it for some time and the other man was going to work instead of him. In order to help to get the piece down Pierce Griffith went to put something underneath it. The piece of rock then came down, but it took a direction that he did not expect, and he was struck by it and killed.

2627. Do you consider that that was an accident?—Yes, as far as I could see.

2628. Do you think that that could have been avoided in any way?—Very likely it could have been prevented if they had been working it from the top, and not underneath.

2629. How was the other accident caused?—The man was working in a fall, and the fall began to come down, and some of it fell upon him.

2630. Do you consider that the other two accidents could have been prevented in any way?—I do not know how they could have prevented the first, the one that happened to Robert Griffith in 1884. In the other case I think if they had been working perpendicularly it might have been different.

2631. You are referring now to the case of Pierce Griffith?—Yes.

2632. Could there be a way of working that piece of rock different to the way in which it was worked?—There is no other way except by taking down the granite.

2633. Do you work under the granite?—Yes.

2634. Is that granite solid?—Some of it is very solid, but the other is not.

2635. Does it hang over in general throughout the quarry?—Not everywhere, but it does in that side all along.

2636. Do many accidents occur at your quarry which are not fatal?—Yes, there are some.

2637. And how do they generally happen?—Lumps fall very often. It is a great depth.

2638. The fall of rock is the chief cause of accidents in the Upper Glynrhonwy?—That is the most dangerous thing there is.

2639. Have you had any accidents in consequence of the road being too near near to the edge of the gallery?—Yes, I have seen two men falling over.

2640. Have you seen any accidents through blasting or in connexion with powder in any way?—I saw that happen some years ago to two men, and one of them nearly lost his sight.

2641. Have you seen any accidents in consequence of the tops being left too heavy?—I saw three being killed owing to that, but not during the last 10 years.

2642. Was that an accident which happened in consequence of leaving the top too heavy?—It was the top getting loose.

2643. I suppose there are many of those in your quarry?—Yes.

2644. And do you think those should be provided against?—I should think it is impossible to be too careful, because they are so apt to loosen without anyone expecting it.

2645. Have you a large frontage of rock?—No, we are working underneath the granite.

2646. Do you leave any support to hold up the granite?—If the slate happens to be of poor quality we leave it there.

2647. But you do not leave good rock if you can help it?—No, we do not often do that.

2648. (*Mr. Richmond.*) One of the accidents you alluded to was in consequence of a fall from a ladder?—Yes.

2649. It happened to a man named Owen Owen?—Yes.

2650. In January 1889?—Yes, I believe it was.

2651. How many accidents do you say there have been during the last ten years?—Three.

2652. Owen Owen, Robert Griffith, and Pierce Griffith?—Yes.

2653. (*Mr. Williams.*) How do you do on wet days at your quarry; do you work in your wet clothes?—We go to shelter when it is raining.

2654. Then you are not obliged to work on a very wet day?—No.

2655. Supposing it rains in the morning before noon, are you expected to work, or are you allowed to go home?—If it looks like being wet all day I have never heard anyone say anything against our going home.

2656. Have you proper places to get your food in?—No, we are rather badly off in that respect.

2657. What kind of a place have you got there?—We have only the sheds and the huts.

2658. Have you any place to warm your food in?—We have the machine-house.

2659. Do you eat your food at the machine-house as well?—Most of the men take it to the shed to eat, but some of them eat it in the weighing machine-house.

2660. There are small holdings about your neighbourhood where the quarrymen live?—Yes.

2661. And many of them keep a cow or two?—Yes.

2662. (*Mr. Vivian.*) Have any of you four met with a serious accident at any time?—No, never. (Robert Hughes added: The most important accident during the last 10 years happened to a man in a place where no one was working. He was going to his work and a piece of rock fell from a place that was not being worked at the time).

2663. (*Mr. Richmond.*) That was owing to the weather, I suppose?—Yes.

2664. (*Mr. Williams.*) Are these places attended to now?—No, they are not.

2665. (*Mr. Evans.*) Do you consider that places that are not being worked should be examined periodically?—Yes, certainly, inasmuch as men have to go underneath these places.

ROBERT OWEN OWENS and OWEN OWEN MORRIS, employed at the Cilgwyn Quarry, were called into the room together.

R. O. Owens and O. O. Morris.

2666. (*Mr. Darbishire to R. O. Owens.*) Are you a quarryman?—Yes, both of us.

2667. How many years have you worked in a quarry?—For 18 years.

2668. (*To O. O. Morris.*) And how many years have you worked?—16 years.

2669. (*Mr Richmond to O. O. Morris.*) You understand what the object of this inquiry is?—Yes.

2670. Have you anything to suggest that should be done at your quarry with the view to diminishing the dangers to quarrymen?—I believe they ought to clear the tops more than they do.

2671. Do you think the tops of the quarry and the galleries are not sufficiently cleared?—Yes, I do.

2672. Do you think you have sufficient shelters provided for blasting?—Yes, we have.

2673. And have you sufficient rules as to blasting?—Yes.

2674. And they are printed and posted up?—Yes. I consider the two minutes allowed is not sufficient for the men to get out of the way.

2675. How do they give notice at your qnarry?—They blow a whistle.

2676. How many times is the whistle blown?—There is one blown as a signal for us to get into shelter, and in two minutes another is blown for the fuse to be ignited, and in three minutes there is a third blown for us to return to our work.

2677. What is the first signal?—One blow of the whistle.

2678. And are the three whistles the same?—Yes.

2679. (*Mr. Vivian.*) How would you wish this improved upon?—I think that 10 minutes would not be too much, instead of five minutes as at present. If a man is blasting in the middle of the gallery it requires time to get up and down, and the time at present allowed is not sufficient.

2680. Have any accidents happened through that mode of blasting?—No, none.

2682. (*Mr. Richmond.*) During the last 10 years there have been six accidents at your quarry, have there not?—I have a list of six accidents since 1888.

2683. But there were no accidents for some years before 1888?—No, I believe not.

2684. So that six is the number for the last 10 years?—Yes.

2685. Three of those accidents occurred through men getting into waggons and going down the incline ropes in them?—Two of them happened in that way. In the third case the man was with his work.

2686. Was that the case of Owen Hughes?—Yes.

2687. Which happened in April 1890?—Yes.

2688. He fell from an ascending waggon, did he not?—No, he was descending in the tank and it got off the rails.

2689. How did that accident happen to Owen Hughes?—I was at the bottom myself at the time. The tank was coming down and he had been fetching powder. He was in the tank and a boy with him, and the tank got off the rails and capsized, and he fell out of it.

2690. The last two accidents occurred through the incline rope giving way?—Yes.

2691. And there were two cases on the same day?—Yes, one was fatal and the other was not.

2692. J. G. Williams and J. Roberts; they were both killed were they not?—No, one is alive to this day.

2693. How many accidents do you say you have had during those 10 years?—Six.

2694. Richard Hughes is the first?—Yes.

2695. And then come John Williams, Owen Hughes, John Evans, Evan Hughes, J. G. Williams, and J. Roberts?—No, he was alive yesterday, at any rate.

2696. Which is the man who is alive?—J. Roberts.

2697. But there has been an inquest upon him?—No, never.

2698. The last one that happened through the incline rope giving way was because it gave way where it was fastened in the rock?—Yes, that was so.

2699. It was not properly fastened, I suppose?—No, there was a piece of chain in the rock, and the rope was put through, and two clamps were put behind it, and it ran through them all.

2700. It had not been tested beforehand, I suppose?—It had just been re-fixed.

2701. Had it been tested at all with a load?—No, it had not.

2702. Do you get your things from your quarry by means of chains?—Yes, one engine with chains and the others with guiders.

2703. Then you have one getting them up perpendicularly?—Yes.

2704. (*Mr. Evans.*) Could you not get them all to do the same?—We could work the guiders or tanks the same.

2705. Which do you consider the safest?—The tanks.

2706. Then you would recommend that the whole should be worked by tanks rather than the other way?—Yes, I should.

2707. Have you any galleries in your quarry?—Yes, in one part of the quarry.

2708. What is the depth of the one where there is no gallery?—It is about 160 yards.

2709. That cannot be worked in galleries, I suppose?—No, it is already worked out.

2710. What is the width of the galleries in the other part of the quarry?—There is only a short distance between them.

2711. But what is the distance?—The greatest distance is not over 18 yards.

2712. Is that not the bottom?—No, there is a sink below that.

2713. What are the other galleries, 2 or 3 yards?—Yes, about that.

2714. Have you tramways on those galleries?—Yes.

2715. What is the distance between the rail and the side of the gallery?—Only the width of the road in most places.

2716. Are there men working below those places?—Yes.

2717. Do you know of instances where things have fallen from the waggons and hurt the men below?—No, I do not, but it is always liable to do that.

2718. Do you consider it very dangerous?—Yes.

2719. How would you remedy that in your quarry?—We cannot do so without working more on the tops. They cannot get more room on the galleries without clearing more of the tops.

R. O. Owens and O. O. Morris.

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2720. Is there any kind of supervision over your bargains, except the supervision you exercise yourselves?—No, except that the overlooker comes to see them sometimes.

2721. There is no kind of inspection before you commence to work in the morning?—No, nothing at all of that kind.

2722. If you see anything dangerous and inform the manager of it, I suppose he will have it cleared?—Yes, always. He is very careful in that way when anything is mentioned to him.

2723. Do you work in wet weather or are you allowed to leave your work on a very wet day?—In the morning we must work until about 10, or we shall lose half a day. It is understood that if it rains in the morning we are not to go to the quarry, but if it gets fine about nine we are allowed to go there, and in that case we must keep at it until 12.

2724. (*Mr. Evans to R. O. Owens.*) What have you to say about that?—I quite agree.

2725. When do you begin work in the morning?—We work from 6.30 to 11.30 and from 12.30 to 5.30.

2726. (*To O. O. Morris.*) Many years ago there was a serious accident at Faengoch, which you have, perhaps, heard of?—Yes.

2727. Does the rock overhang much at present?—Yes, it does, but not so much as it used to do.

2728. Does anything come from it now and again?—No, nothing during the last two years.

2729. But you have had a fall there?—Yes.

2730. Was anyone hurt?—No.

2731. Had you a fall there within the last few weeks?—Yes, there was one on the 11th of July.

2732. This year?—Yes.

2733. Was it a large fall?—Yes, very. Thousands of tons came down.

2734. And did you get much of a warning before it came?—No.

2735. Did you get any warning at all?—Two lumps of it came, one at 20 minutes to eight in the morning, and another in five minutes afterwards.

2736. Were you made aware of the fall of those lumps?—We saw them falling.

2737. And you took no notice of them?—No.

2738. Where were you when this big fall came down?—We had gone to shelter at blasting time. It was eight o'clock.

2739. And what took place when you were in the shelters?—The fall came down.

2740. Then what saved you was that it happened to be blasting time?—Yes, we would have been there except for that.

2741. How many of you would have been under that fall if you had not been in the shelters?—About 20 or 25.

2742. I suppose there is not much difference in working the quarry now to what it used to be?—No.

2743. You have falls every two or three years, I believe?—Yes, and we shall probably have more unless it is worked upon a better principle.

2744. (*Mr. Vivian.*) Have you got many very narrow places in the quarry?—Yes, there are four galleries, and three of them are very narrow.

2745. How far is the tramroad from the outside?—It is not more than 3 or 4 inches in one place. We have a bridge at one place.

2746. All along?—No, only a portion of it.

2747. Does the bridge go along all the portion which is narrow?—Yes, it is narrow for a good distance.

2748. Is it bridged over the narrow part?—Only in one place.

2749. Is it bridged and fenced or only bridged?—It is only bridged.

2750. What is the bridge made of?—Timber.

2751. Is there anything on the side of the bridge?—No, there are balks of timber with slabs on them.

2752. Supposing a slab tumbles down, what happens?—It would go down easily.

2753. Is there anyone working underneath?—Yes.

2754. As regards the officials, how many have you?—There are two.

2755. What are they?—The bargain-letter and the overlooker.

2756. Do not those men look at the bargains in the morning?—They do not come down in the morning at all sometimes, not until the afternoon.

2757. Do you both work in the same bargain?—No.

2758. How many bargains are there in the quarry, roughly speaking?—12 in one part of the quarry, and 15 or 16 in the other part.

2759. About 28 altogether?—Yes.

2760. Do you mean to tell me that you men go to your bargains and do not look at them before commencing work?—They just look at the bargain, but they do not go and examine it.

2761. They look at it sufficiently to know whether it is safe or not?—We are up and down continually and we do look. (R. O. Owens added: I always examine it when I am at the bottom.)

2762. (*Mr. Richmond* to *R. O. Owens.*) Are there any fixed rules in print that the men are not to go down in the waggons at all?—The men were going to their work in the tank.

2763. Had they got any permission to go at all from the manager?—Yes.

2764. But the manager told me that they went without any permission whatever?—Ever since then they do not go unless the manager is there, or his agent.

2765. (*Mr. Evans.*) Have you any suggestion about cranes?—No; but I should like to say that we have no proper place to take our meals in.

2766. (*Mr. Vivian.*) What eating houses have you?—Only where the engines are.

2767. Then you do not go into the weighing machine-houses at all?—No, they are very small, and only four or five can go into them.

2768. You have no proper eating houses?—No, we have not, and I believe that a great many men suffer on that account through the distric generally. There is a general complaint as to the absence of eating houses.

APPENDIX III. (A.)—*cont.*

FOURTH DAY.

At the Penmaenmawr Hotel, Penmaenmawr, 9th August 1893.

PRESENT:—

Mr. Frank N. Wardell in the Chair.
Mr. W. A. Darbishire,
Mr. W. J. Williams,
Mr. J. J. Evans,
Mr. H. S. Richmond, Secretary.

The following gentlemen were present together:—Mr. C. H. Darbishire, J.P., and Mr. Frederick Williams, representing Darbishire's Granite Quarries, Penmaenmawr; Mr. William D. Jones, representing Messrs. Brundritt's Granite Quarries, Penmaenmawr; Mr. George Farren, J.P., and Mr. William Farren, of the Welsh Granite Co., Llanaelhaiarn; Mr. Henry Kneeshaw, J.P., and Mr. J. P. Faichney, on behalf of Messrs. Kneeshaw, Lupton, & Co., Limestone Quarries, Llanddulas; and Mr. J. W. Raynes, of Messrs. Raynes & Co., Limestone Quarries, Llanddulas.

Mr. Charles H. Darbishire, J.P., examined.

Mr. C. H. Darbishire, J.P., &c.

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2769. (*Chairman.*) Have you had any accident at your quarry in connexion with falls of ground in any shape or form?—Yes, there have been.

2770. Has there been any accident which has injured any of the workmen in the course of their work?—How far back do you wish to go?

2771. Say during the last ten years?—We have had one fatal accident from a fall of rock.

2772. Will you describe how that occurred—did it fall from one gallery to another?—No, it never does in our galleries. They are so wide. They never fall from one to the other.

2773. Was it a fall of rock from a blast which was beyond the control of the workmen who were engaged in the work?—Yes.

2774. It was entirely beyond their control?—Yes, it was.

2775. Was there any blame to be attached in that case to the men below?—No, none whatever.

2776. It was a pure accident?—Yes.

2777. What was the name of the man who met with the accident?—Thomas Jones.

2778. And when did it happen?—In 1885.

2779. Was that the one at the top?—Yes, it was, but the stone fell from about half-way up.

2780. And the man was working at the bottom?—He had just got there. It was rather early in the morning.

2781. So he had not begun to work?—Hardly.

2782. It was not a case of his being on a rope or anything of that kind?—No, he was a sett-maker down below.

2783. Is that the only accident during the last 10 years from a fall of stone?—Yes, it is.

2784. (*Mr. Richmond to Mr. Frederick Williams.*) Do not you recollect any others?—No, I do not.

2785. Was there not a case of a William Jones who was killed on the 24th of December 1883, struck by a piece of stone?—No man of the name of William Jones was ever killed in our quarry.

2786. It is returned in the coroner's return as having happened at your quarry?—It was not in our quarry.

2787. (*Chairman.*) Were you there in 1883?—Yes.

2788. And you do not remember anything about a man of that name?—No, I do not remember anything at all about it. It must be a mistake.

2789. (*To Mr. C. H. Darbishire.*) Was there anyone killed at your quarry at all in 1883?—No.

2790. There was a man named Thomas Jones killed in 1885?—Yes; he is the man I have just told you of.

2791. And there was a man named Owen Hughes also killed?—No, we never had a man of that name killed at our quarry.

2792. That is also returned by the coroner as having occurred at your quarry?—That is also a mistake. I am quite certain of that.

2793. (*To Mr. William D. Jones.*) Did this case of Owen Hughes happen at your quarry?—Yes, there was a little boy who fell out of a waggon.

2794. Had you a man named William Jones killed at your quarry?—No.

2795. He is returned as having been killed in December 1883?—Owen Hughes was the name of the man that was killed in our quarry.

2796. Was that in 1882?—Yes, I think so.

2797. But there was a William Jones in December 1883?—But that was not at our quarry.

2798. Had you a man killed at all in 1883?—Yes.

2799. How did that happen?—He got into a waggon.

2800. He jumped into a waggon and was killed?—Yes.

2801. Was that not in 1889?—There were two little boys killed by the waggons as well.

2802. How were they killed?—One of the straps got loose.

2803. What were their names?—Owen Williams and O. H. Edwards.

2804. But those were in 1884 according to the coroner's returns?—Perhaps it was 1884.

2805. And Owen J. Davies was killed in 1889?—Yes.

2806. He met with his death in trying to jump into a waggon?—Yes.

2807. (*To Mr. C. H. Darbishire.*) What do you do in order to see that the tops are safe?—The dangerous time in a quarry such as ours is during the winter, when it freezes at night, and the hot sun which we often get in January and February thaws the ground at the top. The drillers go there regularly every morning and make the place as safe as it possibly can be made.

2808. What examination is there made at your quarry by any official, or is there any such examination before the men begin their work in the morning?—Yes, there is a sub-agent on the top bank whose business it is to see that everything is safe in the morning.

2809. Before the men begin work?—Yes.

2810. And are the men themselves supposed to examine their own places?—Yes, they are; they are contractors, and they know what their bargain is before they touch it. They need not go there unless they like; and if a man says, "My bargain is dangerous," all the agents have instructions to carry out whatever the men wish to make the bargains safe.

2811. What space is there between the rails of the tramways and the edge of the galleries—can you give us the minimum and the maximum space?—No, I cannot.

Mr. C. H. Darbishire, J.P., &c.

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2812. About what space is there?—The top gallery, which you have seen this morning, is a very good example of the others.

2813. What is the width of your galleries?—They are always deep.

2814. How deep are they?—They are at least 20 yards horizontally.

2815. So that there is no need for you to have the tramways near to the edge of the galleries at your quarry?—No, except that we like to have big falls. One does not care to alter the tramways until it becomes necessary.

2816. Have you the rails so near to the edge anywhere that you require fencing?—No, I never knew a quarry with fencing, not between the road and the edge of the gallery.

2817. And you have not had any accidents which have resulted from the want of fencing in such places?—No.

2818. Have you ever had anything fall from a waggon to the ground below?—No, never.

2819. And no men have ever fallen over those places?—Never.

2820. The ropes that are used in the quarry are provided by the workmen, I believe?—No, we provide the ropes, but the men buy them from us.

2821. What system have you in force with regard to the inspecting or examining of those ropes?—The agent is to see that the rope is in proper order, and the man himself will not go down a rope that is at all liable to break. I never knew of an accident through a rope breaking. The only accident with a rope that I have ever known was where a man fixed the wrong end of the rope, and he fell down.

2822. Do you think it is likely that the workmen would inform you if they find out that the ropes are unsafe?—I think they would, because the cost of a rope is not very great. The men work for so much a ton of the produce. We have about 30 drillers, and they divide between them what is earned, so that the cost of a rope is a very small matter to each individual driller.

2823. In comparison to the width of the galleries what is the height?—The deepest is 36 yards—that is the top one—and the smallest is 25 yards.

2824. Then about 30 yards would be the average, as near as possible?—Yes, about that.

2825. You have had accidents at your quarry which have not been fatal?—Yes.

2826. Several?—Yes. In 1891 Robert Williams, a rockman, was hit on the head by a falling stone.

2827. That was not a fatal case?—No.

2828. The only fatal accident is the one you have mentioned?—Yes.

2829. The case of Robert Williams is not the only non-fatal accident during the 10 years?—No.

2830. To what causes are the principal non-fatal accidents due?—I have a list here of a few (*list produced and handed in*).

2831. Will you tell the Committee how the principal ones occurred?—In 1883 Robert Roberts broke his spectacles, and injured his eye. I may say that we sell these spectacles to the men at a very small price. I believe they are only 6½*d.* each. The reason why the men always have to buy their own tools is that unless you adopt that rule very little care is taken of the tools. If the men do not pay for these things they get damaged or mislaid, and they get careless with them; but if they are made to pay for them, they always keep them in proper order. Of course the price is arranged, and it is fixed as low as it possibly can be. There was also the case of Richard Jones, a rockman, who fell and hurt his head. It was only a temporary disablement, and he soon got round again. John Jones, Ocean View, lost his eye. He was a set-maker at the time, but he is now our under manager. In 1884 we had no accidents. In 1885 David Davies was blown off a bin wall, and broke his arm. In 1886 Thomas Jones was riding up in an empty truck and was thrown out, and he had his shoulder dislocated. I think that too many men were crowding there together, and that is how he was thrown out of the waggon. In 1888 William Williams, head driller, was injured in re-drilling a hole. A curious thing in connexion with this accident was that this man had previously lost the sight of one eye, or nearly so, and as the result of the accident he can now see very well with the eye that was formerly almost useless. In the same year, 1888, John Lloyd was re-drilling a hole, and was injured. Robert Williams I have already referred to.

2832. He was hit by a falling stone?—He was in the ropes, and a stone fell on his head.

2833. Did it fall from the gallery above?—No; it was not anybody else that knocked it down. There was a man named Thomas Walsh who tried to jump between the waggons. He fell down, and a waggon went over one of his legs. The muscles in the upper part of the leg were injured, but he got all right again. James Ellis while charging a hole was injured through the charge exploding. I do not know why this happened, but I believe it was because he was smoking at the time.

2834. Did he fire the powder?—Yes, and the drill went through both hands. He was rather badly injured, but he went to the infirmary at Bangor, and he is now at work again. William Thomas fell and dislocated his shoulder, and Owen William Roberts was loading a waggon, and was hit on the head, but he is all right now. In 1893 William Jones got a splinter of stone into his eye, but he is now well again. Those are the chief non-fatal accidents which have occurred during the last 10 years.

2835. The majority of those appear to have occurred through injuries to the eye, and from the process of unramming powder?—There are two which occurred in drilling, I think.

2836. Do you use loose powder or cartridges?—Loose powder.

2837. And not in cartridges?—No. There was one fatal accident through powder.

2838. Then you have only had two fatal accidents?—No, there are five fatal accidents during the last 10 years.

2839. How did they happen?—Thomas Jones was killed by falling rock in 1885. He is the man I have already told you of. In 1887 a driller was filling a hole with powder, and some of the powder ignited. In 1889 Edward Hughes was killed by a waggon, and we have had two accidents in 1893.

2840. You have had two accidents this year?—Yes.

2841. How did they occur?—One was loading waggons in the mill down at the crushing machinery. He did not get out of the way in time. The other, William Williams, in bringing out his waggon from his bargain ran on in front to see if the points were right, and a waggon went over his legs.

2842. That was in July last?—Yes.

2843. Is there any suggestion that you have to make to the Committee which would tend to prevent any of those fatal accidents which occurred at your quarry. Is there any rule that you can suggest which would render accidents of the kind less likely to happen?—I cannot suggest anything; the fact is that we take every possible precaution.

2844. Have you any rules at your quarry printed or hung up, or anything written or printed?—No, we have not.

2845. There are simply verbal instructions by the manager and the staff?—Yes, and the men who have worked there from their youth, and who have far better experience probably than I have myself. There is an established rule at the quarry that whenever anybody complains of anything, it is to be attended to at once.

2846. Do you find that there are complaints made to you by the men?—I do not. I may say that I was at Sheffield when I got notice of this meeting, and I at once telegraphed to the manager to let the men know of it, so that they might have every opportunity

of coming down here to say anything they wished to say.

2847. (*To Mr. Frederick Williams.*) Have you received any complaints that you have not referred to Mr. Darbishire?—None whatever. I received a message at the office just now that the men wished to say that they had nothing at all to complain of.

2848. And that they had nothing that they wished to say to this Committee?—Yes, that is so; I was instructed by the men to say so.

2849. (*To Mr. Darbishire.*) Will you describe to the Committee the arrangements you have in force for blasting?—There is a head driller. All the drillers join in the earnings. They divide a certain amount of the earnings.

2850. Are the drillers the only persons in the quarry who use powder?—Yes.

2851. None of the other workmen use it at all?—No, only the drillers. They take the powder or explosive which is allowed to them, and they have to put it in the magazine. We have one license from the Secretary of State, and one from the magistrates for the purposes of distribution. The drillers go and ask for their powder for the day, and one or two cwt. is taken out of the magazine and put in the magazine licensed by the local authority; we never have very much there at a time. The drillers then take the powder out of that magazine as they require it, and they control and light the holes. There are two galleries, and there is a head driller whose business it is to know in each gallery how many holes have to be fired every time; he then blows the horn and the hole is exploded. About 10 minutes is allowed, according to the time required; we do not light all the holes at once. As you saw this morning, when the men were blasting, the last hole was fired only after all the others had gone off.

2852. You do not allow 10 minutes between the first and second horn?—Yes, if necessary.

2853. Then you have not a regular fixed time?—It is about 10 minutes.

2854. It was not 10 minutes this morning, was it? That is in one part of the quarry. You only saw one gallery this morning.

2855. Then the time varies?—In the quarry where you saw the blasting there is only one gallery, but in the other quarry there are six galleries, and it is always 10 minutes there.

2856. Then you have a third horn?—After the horn for the firing has blown the firing takes place, and the man who has the horn knows exactly how many have to be exploded. He does not blow the last horn until he knows for certain that the last hole has gone off.

2857. Supposing a shot does not go off?—He knows what number are to go off.

2858. Supposing they do not all go off, what does he do?—In that case they wait.

2859. How long do they wait?—That depends entirely on the driller; we have no special time.

2860. Then he decides how long to wait?—Yes, it depends what kind of place it is.

2861. And supposing it does not go off at all, what does he do then?—I would rather you ask my manager that question.

2862. (*To Mr. Frederick Williams.*) Can you answer the question?—He reports to the man down below that there is a miss-fire, and they please themselves whether they go back to work or not. In nine cases out of 10 they take their chance and go back, and when they go back the drillers open the hole. The system of firing is so thoroughly understood that even the dogs that come to the quarry know what the horns mean.

2863. They are allowed to use their own discretion as to whether they will go back to drill out the missed shot?—That is left to their own discretion, but I warn them of the danger attached to it, and they go back at their own peril.

2864. You mean you warn them verbally?—Yes, I tell them that there is a miss-fire, and that if they think there is any danger they are not to go back.

2865. Do they drill out the missed shot or put in another?—They put some water in and open it out.

2866. They withdraw the charge?—Yes.

2867. With what tools do they do that?—They generally have a little hook about three feet long, and pull the stamping out.

2868. What is it made of—iron?—No, copper or brass.

2869. Is it copper throughout, or only a copper end?—Either copper or brass throughout.

2870. Have you had any accidents during the time you have been there in opening out those missed shots?—No, none at all.

2871. Do you ever in any case allow them to put another in close to the miss-shot without unramming the miss-shot?—No, that is strictly against orders.

2872. Is that more dangerous, do you think, than unramming the old shot?—It is all right if you damp it.

2873. But you consider there is some danger in it?—Yes.

2874. But you allow them to do it at their own risk?—The men prefer to do it, they do not get permission to do it.

2875. You said just now that you told them verbally it was at their own risk?—Yes.

2876. You have no knowledge, so far as your experience goes, of any accident which was caused through re-drilling?—No, there has not been any.

2877. Was there not the case of John Ellis, a driller?—Yes, there was that one.

2878. And William Williams, head driller, re-drilling hole when it missed fire; do you remember that accident?—Yes.

2879. Then did you not understand the question I put to you just now?—No, I did not.

2880. I asked you whether you had known of any case where accidents had happened through drilling above missed shots, and you said "No"?—Yes, I did, but I did not quite understand the question at the time. William Williams was the head driller at that time, but after that accident we reduced him, we put another man in his place because he did that.

2881. (*To Mr. C. H. Darbishire.*) Have you anything to say with regard to neglecting to retire to places of shelter at blasting time?—It is difficult to get them to do that.

2882. You have shelters provided for them?—Yes.

2883. But you find it difficult to get them to go there?—Yes, it is very difficult.

2884. Have you any difficulty in making them stay there the required time after they do go in?—No; if they once get there they stay there until the horn blows.

2885. Have you had any accidents to the public generally at your quarry?—They are not allowed there at all.

2886. But they do trespass sometimes, I suppose?—We have never had an accident.

2887. Have you a fence there?—Yes.

2888. What kind of a fence is it?—A wire fence.

2889. What have you got to say with regard to accidents in connexion with your machinery?—I am glad to say we have never had any, if you mean accidents in the mill.

2890. I include not only the mill but all the other machinery?—We have had no accident due to the mechanism, but we have had the waggons running over people.

2891. I am taking the inclines as well?—Yes, Edward Hughes was killed by a waggon, but that was not due to the machinery.

2892. That was owing to the scotch not being there?—Yes.

2893. And you have had no accidents from the bursting of the boilers?—Our boilers are only four years old.

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2894. But you have not had any accident with them?—No, we have not.

2895. That machinery has been there for about three years?—No, for four years.

2896. Have you got any ambulance class at your quarry?—No, we have no class.

2897. Have you had any ambulance instruction at the quarry?—No.

2898. There has not been any at all?—No.

2899. Have you had any applications on the part of the men that there should be one formed?—No.

2900. And you have had no suggestion made by the medical man who attends the men as to starting one?—No, I have not.

2901. Have you thought yourself that it would be advisable to have ambulance classes?—I think it would be a good idea.

2902. Still you have none in existence now?—No, we have not.

2903. Have you any ambulance appliances at the quarry at all?—Yes, I have a St. John's ambulance basket, and I have also a stretcher. There is a great objection on the part of the men to use the stretcher. They consider that if they are in that stretcher that it is next door to being buried, and they prefer going in the waggons. It is a first-rate stretcher, and might save a man's life.

2904. It is an ordinary St. John's ambulance stretcher, I suppose?—Yes, it is.

2905. Do not you think it would be very much better, since you have the ambulance appliances, that you should have the men properly taught?—I do. I think that if William Williams, who was killed in July, had met with a slightly less severe accident we might have saved him.

2906. Have you a doctor in connexion with the quarry?—Yes.

2907. What do the men pay in respect of his services?—They pay 6*d.* a month, or rather it is deducted out of their wages.

2908. You have not formed any plan with your medical man for the establishment of ambulance classes?—No, I have not.

2909. But it is under consideration?—No, it is not as yet, but I think it would be advisable to form one.

2910. You have had cases, I suppose, where the prevention of bleeding might have been effected by men who had gone through an ambulance class?—In the last case the man died very quickly. The waggon crushed his leg, but there is no reason why he should have died so quickly, except for the excessive shock and the bleeding.

2911. You have no tunnels in connexion with your quarries where the men have to pass to and fro in their work?—No, except in the mill.

2912. Do you consider that your quarrymen are physically healthy?—I would rather that the doctor should give evidence on that point, but for myself I believe they are. They work very hard, and get through a large amount of work with ease.

2913. Supposing they get wet on the way to their work, what happens then, do they work in their wet clothes?—No, they do not.

2914. Is there any objection to their leaving work if they get wet?—No, we have never been able to fix any specified time like the slate quarries at Festiniog. I came there from the railway myself, where time is kept very strictly, and I built a dining-house for the men with a view partly to creating a system of proper time-keeping, but it had no effect. Many take their dinner at 10.30. They take their breakfast before they start from home, and at 10.30 they are hungry and they then take their dinner. Others again, who do not take their breakfast so early, do not want their dinner until 12.

2915. In the case of men who live at a considerable distance from the quarry, and who get wet through before they reach their work, is there any objection to their returning home without doing their day's work?—No, not the slightest.

2916. They are not compelled to work in their wet clothes?—No, certainly not. A man is perfectly free to work or not, just as he likes.

2917. (*Mr. Richmond.*) Do you know how many hands you employ?—They vary from 350 to 400.

2918. And you work in galleries?—Yes.

2919. Do the numbers you have given include boys as well as men?—Yes.

2920. But the majority of course are men?—Yes. There are very few boys, only about 30, I think.

2921. You have seen the suggested special rules, as they are called?—Yes, I have.

2922. You have fixed rules as to blasting?—Yes.

2923. They are verbal rules?—Yes.

2924. Notice is given of the time for blasting?—Yes, by means of a horn.

2925. And there is an interval before another horn is blown?—Yes.

2926. But that is a varying interval?—Yes, the driller knows that if he does not carry out those rules properly he would be dismissed. In the case of William Williams, he did not do his work properly, and he was reduced in position.

2927. You do your blasting under certain rules, whether they are printed or not?—Yes.

2928. So you do not see any objection to there being special rules as to blasting?—I should prefer that a horn should be blown "not less than five minutes" instead of actually fixing five minutes, as the proposed special rule does.

2929. But you do not see any objection to a rule of the kind?—No.

2930. You have shelters provided at your quarry?—Yes, certainly.

2931. And you see no reason why they should not be provided everywhere?—No, certainly not; they ought to be provided.

2932. And there ought to be means to compel the men to use them after they have been provided?—I do not know how you can make them.

2933. But if a man disobeys the rules he would be liable?—If the rules come into operation, and a man is injured as the result of not carrying them out, he ought to be responsible.

2934. So long as the masters see that they are generally carried out?—But how are you to do so?

2935. If you have a rule as to shelters to the effect that the men must enter them at blasting time, and the manager stands there and sees that the men do not go into the shelter, and allows them to break the rule, the responsibility rests very much with the manager and not with the men, does it not?—In many cases the blasting is only a very small matter. Sometimes, on one gallery, it will be only cracking stones, so to speak, and in that case the men do not go more than 15 yards away. They just go round the angle of the rock.

2936. As to the third rule, with regard to ropes, I suppose you have no objection to a rule of that kind?—I have never known an accident on that account.

2937. Your men do use ropes?—Yes.

2938. With regard to the tops of quarries and galleries, you consider that good quarrying does not leave overhanging?—No, it does not.

2939. We did not get from you the distance between the rails of the tramways and the edge of the galleries; have you any place less than three and a half feet?—No, not now; but we had. I think Mr. Wardell saw that this morning. It is on the top gallery.

2940. Do you think three and a half feet is excessive or not?—No, I do not think it is.

2941. You think it is about right?—Yes, but sometimes there may be a place where there is a short length, and it would be rather an unnecessary expense to be compelled to alter the distance, and you might get yourself into difficulty in another direction by altering it.

2942. But as a general rule you think three and a half feet is not too much?—No, not as a general rule.

2943. As a minimum?—Yes.

2944. And you think there should be sufficient breadth in comparison to the height?—That depends upon the quarry. In granite quarrying you ought to have from 15 to 20 yards.

2945. But as to the proportion between the height above and the level of the gallery, do you think there should be any proportion between the two as in the case of slate quarries?—They work very different in slate quarries.

2946. Yes; but I am simply speaking as to the height?—They do not bring down such big falls in slate quarries as we try to do in granite quarries.

2947. That means that you think they ought to be broader?—Yes; we want big falls in our quarries, and we work for them; but in slate quarries they do not want them.

2948. The 7th rule does not apply, but with regard to the 8th rule, you have fenced the top of your quarries?—Yes; I think that rule is desirable. The first quarry we went to this morning has not got a fence over it, but nobody goes that way. In the other quarry there is a fence.

2949. What do you say as to Rule No. 9?—If you want a quarry to pay you must have a good man as manager.

2950. You have a qualified man, I suppose?—Yes, he has had 15 years' experience with me.

2951. (*Mr. Richmond to Mr. Frederick Williams.*) You are a Cornish man?—Yes.

2952. What were you employed in before you came to this quarry?—In a lead mine.

2953. (*Chairman to Mr. Darbishire.*) It would not be to your advantage to keep a man who is not competent, in your opinion?—No, nor one who is not competent in the opinion of the men.

2954. (*Mr. Evans.*) Inasmuch as you have had some accidents in unramming holes, would you recommend that there should be a rule to prevent that sort of thing?—I do not think it is necessary. We have no dangerous explosive. Our explosive is pure powder, and there ought not to be any accident with it. We have only had two such accidents in 15 years. They are never fatal or very dangerous. The hole cannot explode until they get down to it.

2955. Can you give any reason why those did explode? Was it owing to some carelessness on the part of the man who was at it?—I should think the tool was not long enough, and that he took a drill to it.

2956. An iron drill?—A steel one, and he did not pour sufficient water into it.

2957. (*Chairman.*) That could have been ascertained afterwards on examination of the drill?—I do not know how you could have done it.

2958. By burning?—Yes, but the drill was blown away, and I do not think it was ever found.

2959. (*Mr. Evans.*) There is another accident which happened, in your opinion, in consequence of a man smoking whilst engaged with powder; do you think that practice should be prevented by rule?—I should certainly think so. I dismissed a man named Owen Williams for that very thing.

2960. Do you think there should be a Government rule to prevent their smoking when they are using powder?—Yes, I do.

2961. (*Mr. Williams.*) I believe you said just now that your manager or sub-manager examined the various places in the morning before the men commenced to work?—If you mean that he goes through the gallery as they do in the case of a coal mine, where a man goes down and puts marks where the men may go, we do not do that; but a man goes round, and we leave it more or less to the sett-maker himself. He knows very well what is right and what is not right, and he need not go into it unless he feels quite satisfied. In the spring time we do send a driller round the top to see that everything is right.

2962. And you said it is more dangerous after a frost, and in summer after rain?—No, I did not say in summer after rain.

2963. But you do send a man in frosty weather?—Yes.

2964. And you find it getting loose at that time?—Yes.

2965. And falling?—Yes, we do.

2966. Then you have no regular inspection before the men commence to work in the morning?—No, not as they have in a coal mine.

2967. Do not you think that would be advisable?—I do not think it is necessary. We do not commence to work until 8.30 in winter, and if that plan were carried out they could not examine it under an hour, so that in that case they could not commence work until 9.30.

2968. How many sub-agents have you at the quarry?—There are three, and two head drillers, and the weighing machine men.

2969. Do the weighing machine men superintend at all?—They are a kind of official that the men can complain to at any time.

2970. Suppose you put all those officials to do it, how long would it take them to make the examination every morning before the men commence work?—It would be a very difficult thing to do, and I think it would be much better to leave it to the men themselves, as at present.

2971. Whenever you do get complaints from any of the men you attend to them at once?—Yes, if a man comes to us, as they occasionally do, and says he thinks it is not safe for him to work we have the matter seen to at once.

2972. The men at your quarry wear spectacles as a protection to the eyes?—Yes, they do.

2973. You have no rule as to that?—No.

2974. I noticed several without them this morning; would it not be advisable to compel them to wear them?—I do not think there are so many accidents in consequence of their neglect to wear them, if you take the number of men into account. I think we have 90 men employed in breaking. We sell them to the men at the very lowest price, in fact at rather less than we give for them, as an inducement to them to wear them, but you cannot get them to do so always.

2975. (*Chairman.*) What proportion of the 90 men employed in breaking use those spectacles?—I do not know the proportion, but I know that a good many of the men buy them from us. The fact is that they can do a little more work without them.

2976. (*Mr. Williams.*) I suppose nearly all the men have them but they will not use them?—Very probably.

2977. I noticed that at the place where you load waggons there is no space for the men to shelter at all?—No, there is not, and I think that is better, for the man never attempts it.

2978. You think it is better without any space at all?—Yes, I should like to have it quite close, so that no man should ever have any chance of thinking that he can get past.

2979. (*Chairman.*) He has really no business there?—No, he has not; if the men thought there was any chance of getting through they would be continually attempting it, and accidents would frequently happen.

2980. (*Mr. Williams.*) As soon as the waggon is loaded he ought to get out of the way?—Yes, as soon as one finishes loading he gets into the refuge. If you had a space there you would have the men trying to get past. At present they cannot do it, and there is no excuse for their attempting it.

2981. I suppose you mean to have a shelter for them when they are blasting at the top, where we were this morning?—Yes, I have given instructions for that to be done.

2982. Why did the man who blew the horn this morning not fire at the same time as the others—he went to fire afterwards?—I do not know what the reason was. Perhaps he thought it was a dangerous hole, and he preferred to fire it at the last shot, but I cannot say for certain what his reason was. Very

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often they fire all the holes off together, but if there is one which they think is likely to prove dangerous, they fire it after all the others have gone off. It was not the man who blew the horn and fired the last shot. I do not know what his reason was for firing it last, but you may depend upon it that he had a very good reason for what he did.

2983. Have you any tramways at the quarry which are not used and where there are people working below?—I think there is on the fifth gallery.

2984. Is there anyone working underneath that?—No.

2985. With regard to accommodation for the men to shelter in and to take their meals in, they have refused the place you showed us this morning?—They have not exactly refused it, but they do not care for it. They allow the windows to be broken, and so on.

2986. (*Mr. Evans.*) In case the Government decide to adopt rules with regard to blasting, do you think that every quarry should have rules of their own to suit their own particular circumstances?—I do.

2987. Rather than that general rules should be fixed to apply to all quarries alike?—Yes.

2988. You would recommend that all quarries should have special rules of their own to suit their own circumstances?—Yes, I would.

2989. (*Chairman.*) But you think a code of general rules might be drawn up applicable to quarries generally?—I do; for instance, when I got my powder license the Secretary of State sent me some draft special rules, and I made one or two which suited my particular case and they accepted them. Mr. Kneeshaw, in his limestone quarries, might have a perfectly different system to mine. He would have the general rule as to horns, but he might have a very different rule as regards blasting. It is impossible to frame rules which will apply to all quarries alike.

2990. (*Mr. Evans.*) There should be general rules for blasting, but every quarry should have an opportunity of having special rules of their own?—Yes; for instance, where there is a gallery only 35 yards wide, and there are six galleries, they want a different class of rules as compared to a case where there are, say, three galleries of 60 yards each.

2991. (*Chairman.*) But there are certain general rules which you think could be made applicable throughout?—Yes, I think so.

2992. What is the material that you stamp with?—It is usually burnt granite.

2993. (*Mr. Evans.*) Do you use dynamite at all?—Very little.

2994. And what do you use as stamping?—We generally use the sand from the mill, but I do not suppose we have used four cwt. of dynamite in five or six years.

2995. Is there any iron in your stone?—No, there is no metal of any kind in it.

2996. I noticed that you can strike sparks off it with a hammer?—Yes, you can, but that is due to the hammer. It sometimes gets red hot.

2997. Your men, I suppose, have the opportunity of using the iron drill in re-ramming?—Yes, but they ought not to do it, and they have been warned about it.

2998. Have you ever known any explosion which was due to copper or wooden rammers?—No.

2999. What length are your rammers?—About 6 inches for a $1\frac{1}{4}$ hole. It is fastened on to the iron rod.

3000. What is the diameter of the rammers?—Seven-eighths when they want to crack a stone.

3001. Do you have many accidents in consequence of blown-out shots, a shot that blows out without doing the work it is intended to do?—No, I do not think so.

3002. The shot we saw to-day did not bring anything down?—No.

3003. I noticed that in the case of the fourth shot to-day it was fired after the signal had been given, and after the other three had gone off?—Yes. He waits until the end, and when all the other shots have gone off the man who blows the horn gives him leave to fire the shot.

3004. He gave him verbal permission?—Yes, or he made some sign or other which they both understood.

3005. Is that sort of thing of frequent occurrence?—Yes, it is.

3006. And what is the reason for it?—Either the shot is going to be a powerful one, or it is facing one way, or there is some other reason.

3007. And that is frequently the case?—Yes.

3008. But it is done only by a man in conjunction with the driller, who knows exactly how the shots are to go?—Yes.

3009. And he always knows?—Yes.

3010. How does he know?—The men tell him.

3011. Do not you think that it is possible that some of the men do not tell him that they have a shot?—It has never occurrrd.

3012. (*Mr. W. A. Darbishire.*) For the time being the head driller is responsible for all?—Yes. He stands at a place where he is seen from everywhere, and during the 10 minutes when he is there nobody can say anything but that man, and if anybody comes there it is his own fault.

3013. (*Chairman.*) Do you ever find that the men go back to their work before the third horn is blown?—No, I have never known of it.

3014. Do they begin to go back at all?—No.

3015. They do not leave the shelter?—No, they do not.

3016. (*Mr. Evans.*) Does that man command any gallery beyond the one he stands on?—In that quarry there is only that one gallery, but in the other quarry he commands the six galleries.

3017. Do you know of any accident that has happened in consequence of the present arrangements as to blasting?—No, never. Nothing has occurred owing to a man going out of the shelter before the last horn has been blown, or a man firing a hole improperly.

3018. Or owing to any defect in the arrangements?—No. It is always the man himself who is injured when any accident does occur. It never injures anybody else.

3019. (*Chairman.*) Have you any hospital in connection with the quarry?—No, we have not; the men prefer to go home.

Mr. G. Farren, J.P.

Mr. George Farren, J.P., Carnavon (Welsh Granite Company), examined.

3020. (*Mr. Richmond.*) You have had four accidents at your quarry during the last 10 years?—No, four in 25 years.

3021. Two occurred during the last 10 years?—Yes.

3022. The names of the men were Griffith Jones and Owen Hughes?—Yes.

3023. One was killed by a fall of rock?—Yes.

3024. And the other was crushed by trucks?—Yes. He was trying to cross the line before the trucks.

3025. Your quarry, I believe, is worked in galleries?—Yes.

3026. The number of men you employ is about 400?—Yes. At one time we employed 700. All our men are employed in sett-making mostly.

3027. What arrangements have you as to blasting?—We blow a horn 15 minutes before the shots, and another in five minutes.

3028. You blow a preliminary horn 15 minutes before the shots are fired?—Yes.

3029. And another in five minutes?—Yes, and the men go to shelter. I may say that there are shelters in every bank. The men at the top galleries have whistles, and when the shots have gone off the whistles are blown.

3030. (*Chairman.*) What happens after the second horn is blown?—The men run away to the shelters.

3031. Until when do they remain there?—Until they hear the whistle saying that all the shots have gone off.

3032. You heard Mr. Darbishire describe the mode of blasting at his quarry?—Yes.

3033. Does the mode adopted at your quarry agree with that?—Yes, except that we pay for the ropes.

3034. Have you anything to supplement what Mr. Darbishire has said?—I do not think I have as to that.

3035. Have you any suggestion to make to the Committee as to the formation of rules to increase the safety of the men?—I do not see how you can increase it. I think the best men to inspect a quarry are the men who are regularly working there. If my foreman comes to me and says there is some place which he considers particularly dangerous, and that he must have three or four men to clear it out, I go there to see it, and I let him have the men he requires.

3036. It is proposed to make certain rules; I believe you have seen a copy of the proposed rules?—I think those rules ought to be in every quarry.

3037. That is your opinion?—Yes.

3038. Your plan and mode of working is similar to that in operation at Mr. Darbishire's quarry?—Yes, it is just the same.

3039. With regard to the galleries, have you anything to say as to the distance of the rails from the edge of the gallery?—I quite agree with the proposed rule. I think 3½ feet about right. I do not think we have anything as narrow as that, and we have had no accidents whatever from that.

3040. From what causes principally have you had non-fatal accidents at your quarry?—There was one miner who lost his leg in consequence of a stone falling upon him.

3041. What is the principal cause of the non-fatal accidents you have had; have they been due to blasting or falls?—We have not had any from blasting.

3042. You have had no accidents in connexion with drilling out missed shots?—No. We always drown it at once, the moment it misses fire. We do not use any dynamite; it is all powder.

3043. You have no iron stamping rods?—No, they are brass.

3044. Have you anything in connexion with an ambulance at your quarries?—No, we have not.

3045. Do you agree with Mr. Darbishire as to the advisability of having ambulance classes?—Yes, I do. I think it would be a very good thing.

3046. Have you a surgeon or a doctor in connexion with your quarries?—Yes.

3047. But you have no hospital?—No, we have not.

3048. Have you an ambulance stretcher?—Yes.

3049. But you have no one who knows how to use them?—Yes, we have.

3050. Have you anyone who knows how to use the "first aid"?—No.

3051. Do your men live at a distance, generally speaking, from the quarry, or close by?—Many of them live in our houses, and others live at Llanaelhaiarn, about 2 miles off. Some of them live as far as Clynnog, 3 or 4 miles off.

3052. Do you consider your men to be a healthy class of men?—Yes, very. I know of no better class of men; they are strong, healthy men.

3053. Have you had any accidents in connexion with your crushing machinery?—We have no crushing machinery.

3054. You say you have shelters provided?—Yes.

3055. To which the men go on the horn being blown?—Yes.

3056. Have you any dinner sheds?—No, the men generally go into the smithies, which are pretty large.

3057. (*Mr. Williams.*) What is the depth of your galleries?—The deepest gallery is 40, and the average is about 30.

3058. And how many galleries have you?—There are seven.

3059. What is the width of the galleries?—They vary.

3060. Give us the variations?—From 200 feet in the large one, to about two-thirds of the height.

3061. You have none under two-thirds?—No, I think not.

3062. Are you sure?—No, I am not sure, because I have not had time to look into the question properly.

3063. But the average is two-thirds?—Yes.

3064. What is the length of your galleries?—I think probably about the sixteenth of a mile.

3065. That would be a little over 100 yards?—I cannot say really what the length is.

3066. How many shelters have you for the men to go into?—There is one on each bank.

3067. Where on the bank?—In a place away from the rock.

3068. You say that the gallery is about 100 yards long?—Yes, about that.

3069. And how far have the men to go from their work before they reach the shelter?—In one place we have two shelters, where the gallery is pretty long. The outside distance they would have to go would be 100 yards. Many of them shelter in the tunnels.

3070. But there is no protection there, and nothing to prevent stones being blown into the tunnel?—Yes it is round the corner.

3071. Do the men sometimes shelter under the rocks?—No, except in the case of a little blasting at the bottom.

3072. You have no proper place for them to take their meals in?—No.

3073. There is no place specially prepared?—No.

3074. Do you think it would be advisable to have such a place?—No, I do not. We have done without it for 40 years.

3075. But do not you consider it would be advisable for the men to have a place of the kind provided for them?—No, they have the smithies to go to.

3076. How large are your smithies?—They vary in size.

3077. How many men on an average have you in a gallery?—They vary very much. Some are small and some are large.

3078. Have you a smithy in each gallery?—Yes.

3079. Are there 100 men working in one of the galleries?—Yes.

3080. And how many of them can go into the smithy at the same time to take their meals?—They can all probably go there.

3081. The whole of the 100 men?—Yes.

3082. So that the smithies must be very large?—Yes, they are large.

3083. Then that is the only place there is for them?—They have huts on the bank that they go into if the weather is fine.

3084. And if the weather is not fine they go into the smithy?—Yes.

3085. Who provides the fire in the smithy for the men?—We do.

3086. So that they have that privilege there?—Yes.

3087. You have never had any complaints as to the want of accommodation of that kind?—No, we have never had any.

3088. The men mostly live in your own houses at Trevor?—Yes, they do.

3089. And they pay you rent?—Yes.

3090. Do you compel them to work during wet weather?—No, they are not compelled to work.

3091. And you do not bind them to stay at the quarry in wet weather?—No.

3092. Your quarry is pretty high on the mountain?—Yes.

3093. Have you any rules as to the men riding in the waggons on the inclines?—Yes.

3094. What are they?—We have notices put up that they are forbidden to ride, but they do ride all

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the same. It is a long way up. Half a mile up an incline of 1 in 3 is rather heavy work, and you cannot blame the men for riding up. Of course they do it at their own risk, seeing that notices are put up forbidding them to do it.

3095. Do you deduct anything out of their wages to pay the medical man?—Yes.

3096. So much a week?—Yes.

3097. How much?—3*d.* a week.

3098. (*Mr. Darbishire.*) With regard to the doctor, do you make the appointment, or do the men themselves?—The men themselves.

3099. Is there any sort of restriction as to the qualifications of the doctor?—No, the men appoint a properly qualified man by their own votes. The present doctor has been there for 15 years.

3100. They do appoint a properly qualified man?—Yes.

3101. But they might appoint a man who is not qualified?—Yes, they might. This doctor is a very steady man, and has apparently given very great satisfaction.

3102. (*Mr. Williams.*) Have you any rule as to the quantity of gunpowder which is allowed to the men at a time?—No, the men buy their own powder.

3103. Do they buy it from your own magazine?—No, they buy it anywhere they like.

3104. But you do provide magazines for the storage of the powder?—Yes.

3105. And who looks after those places?—The men on each bank.

3106. But you do not regulate the quantity of powder that is taken out?—No.

3107. Suppose they have a small quantity of powder that they have not used, do they take it back to the magazine?—I do not know what they do with it.

3108. (*Chairman.*) You do not know what they do with any surplus powder that is not used?—No. I do not. It is all under the sub-manager on each bank, who is responsible for it. I have had no complaints of any accidents on that account.

3109. (*To Mr. C. H. Darbishire.*) Can you tell us what is done with the surplus powder at your quarry?—They do not take more than they can use.

3110. They take what they think they can use?—Yes.

3111. But sometimes there is perhaps a little which is not used; what do they do with what is left?—My manager can answer that question better than I can.

3112. (*To Mr. Frederick Williams.*) Can you tell us what is done with any surplus powder there may be?—When the blasting is over they take any powder that has not been used back to the magazine. It is locked up safely every night.

3113. (*Mr. Evans to Mr. Farren.*) Have you had many non-fatal accidents?—We have had some, but not many. There was a boy the other day who saw a truck going up the incline, and he ran after it and crushed his foot.

3114. What are the causes of most of the non-fatal accidents?—I should say they are mostly accidents in moving big stones. One man had his leg destroyed altogether.

3115. Do you use cranes at all at your quarry?—We use shear legs.

3116. And have you got stoppers to those?—Yes.

3117. Rack-wheels, I suppose?—Yes.

3118. Your rocks are very strong rocks?—Yes.

3119. In what direction does your strata dip, with the workings or against them? You have one gallery 40 yards deep, and with that depth, and a long frontage, I thought it might be a great weakness to that side if the strata runs along the mountain?—It is inclined about 45 degrees.

3120. Against you?—Yes.

3121. So that is a strength to it?—Yes, it is.

3122. You have never a fall from those galleries?—No, except falls that we want.

3123. You have no accidental falls?—No.

3124. And you have plenty of room in the quarries for them?—Yes.

3125. Do you find the men always as careful as they should be in the course of their work?—How do you mean?

3126. In throwing rocks down and so on?—Yes, every man is very careful with that.

3127. And in other ways, with blasting and so on?—Yes, I think they are very careful.

3128. You have nothing to recommend in the way of rules for dealing with men who are careless?—No; of course the men do lots of things to save running about and to save themselves trouble.

3129. Is there anything that they do in that way that should be prevented?—Men run up the inclines, for instance.

3130. Do you think there should be a rule to prevent that?—No, I do not.

3131. You think it should be left as it is?—Yes, a notice is put up in print all over the place, and that we will not be responsible in case of an accident. Of course, if a man breaks the rules that is his own fault and his own look-out.

3132. But the Government propose to have rules to prevent that, if possible; can you suggest anything?—No, I cannot.

3133. Do you think there should be rules to meet a case of that kind?—No, I do not. If a man chooses to pay the price he ought to be allowed to do so.

3134. Has a man a right to kill himself?—Yes, certainly.

3135. (*Mr. Williams.*) If there are rules, there ought to be some fine or penalty if the men disobey?—That is just the difficulty.

3136. Do not you think a penalty would be the proper thing?—No, I do not. If a man breaks his leg through disobeying a rule he has had a sufficient penalty, and ought not to be punished twice over.

3137. (*Mr. Richmond.*) In the special rules for other works there are rules which the employers have to carry out, and also rules which the men have to observe. If you provide a shelter, for instance, the men must be made to use it. If you have a shelter provided at your quarry, and the men do not go into it, and one of them is struck by a stone, do you think there should be a rule under which that man may be taken before the magistrates. No, I do not. I think that to be struck by a stone is quite enough.

3138. (*Mr. Darbishire.*) Supposing a man did not go into the shelter, would you think it right to call the manager's attention to it?—No, I think not, because the rules are perfectly well understood throughout the whole quarry, and if the men will not obey the rules the responsibility rests with them, and they ought to take the consequences.

3139. But the rule would be that the manager would be liable if it was not carried out?—That should certainly not be, because you cannot use physical force to compel a man to obey a rule. I do not see how are you going to do it at all.

3140. (*Mr. Richmond.*) But if the manager stands by and sees a rule being broken and yet does not remonstrate?—That is a different thing.

3141. And if the manager sent the man's name to us, assuming that some such rules are adopted, the man would be liable to be punished?—I do not know.

3142. (*Mr. Darbishire.*) If the workman does not use the shelter provided by the employer, who is to blame, the employer or manager, or the man who does not use the shelter?—The manager cannot be everywhere at once. If the foreman is there, and knows the danger, and tells the man to go into the shelter, and the man does not go, I do not know what more can be done; you cannot push the man into the shelter.

3143. But suppose the foreman did not give the additional warning, is the foreman to be blamed or the workman?—The workman.

3144. But is not the foreman by his presence actually condoning a breach of the rules?—No, I do not think so, because the rule is known throughout the quarry. It comes to a question of the power of

the manager, but I do not think he should be held responsible criminally.

3145. Have you sufficient managers to go and see that the men go into the shelters?—We have one on every bank.

3146. Is he able to be present always?—Yes, on every bank.

3147. To make the men go into the shelters?—Yes.

3148. (*Mr. Evans.*) Do you consider that the employer's liability ends there, by simply providing the shelters and making the rules?—Yes, that is all he ought to be called upon to do.

3149. (*Mr. Richmond.*) But if a manager looks on and allows the men to break the rules, he is to blame?—Just so.

3150. But if he takes all reasonable precaution with the view to seeing that the rules are obeyed, he is not to blame?—No.

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3151. (*Mr. Darbishire.*) Is the putting up of the printed rules which may be authorised sufficient notice to the workman, and ought that to exempt the management from all responsibility in the matter?—Yes, I should think it would.

3152. (*Chairman.*) The men are liable when they break a rule whether the manager knows it or not?—Certainly.

3153. (*Mr. Evans.*) Have you any printed rules in your quarry at the present time?—No, not now, we had at one time.

3154. Do you think there should be?—No. Last winter I put up a notice in my own handwriting that it was dangerous to go to the quarry, and it was torn down.

3155. But you do put up official rules or notices sometimes?—Yes.

Mr. William D. Jones (Brundritt & Co.'s Granite Quarries, Penmaenmawr) examined.

Mr. W. D. Jones.

3156. (*Chairman.*) You have heard the evidence of Mr. Darbishire and Mr. Farren?—Yes, I have.

3157. And you agree practically with it?—Yes.

3158. (*Mr. Richmond.*) You have sent me the returns as to accidents?—Yes.

3159. (*Chairman.*) You have no suggestions of any kind to offer the Committee?—No.

3160. I suppose your quarries are worked on the same principle as Mr. Darbishire's?—Yes, they are.

3161. (*Mr. Richmond.*) You have had five accidents at your quarries during the last 10 years?—Yes.

3162. And all those accidents, with one exception, have been in connexion with waggons?—Yes.

3163. The exception is the case of William Jones?—Yes.

3164. He was injured by a falling stone?—Yes.

3165. All the others were in connexion with the waggons, men trying to get into waggons in motion, and so on?—Yes.

3166. Do you allow people to ride on the waggons?—We have notices put up to say that we do not allow it, but it is quite impossible to prevent it.

3167. You do not try to prevent it. You put up a notice, and let them do it all the same?—If we see boys there we go there to pull them down, but we cannot do that very well with men.

3168. But otherwise you consider that your obligation is at an end when you put up the notice forbidding the practice?—Yes.

3169. Do you agree, generally speaking, with what has already been said?—Yes.

3170. Are your blasting arrangements something similar to those in force at Mr. Darbishire's quarries?—Yes.

3171. (*Mr. Williams.*) Have you plenty of shelters in your quarry?—Yes.

3172. (*Mr. Evans.*) What are the width of your galleries?—Some galleries are as much as 120 yards horizontally, and in some places 60 yards.

3173. Have you any under 60 yards?—We may have one or two.

3174. And what are those?—From 40 to 50 yards.

3175. What is the depth?—From 30 to 40 yards.

3176. What would the average depth be?—About 35 yards, I should think.

3177. And you never have a fall from the galleries unexpectedly?—No, only what we work for. Sometimes we have an accidental fall; but as a rule it gives us sufficient warning.

3178. Are any of those caused by falls from the rocks?—There was only one accident; the fall of one stone.

3179. Where did that come from?—It was thawing at the time, and it came from the top.

3180. From the top of the gallery?—Yes.

3181. You are not affected by loose rock at the top in winter?—No, we are not.

Mr. Henry Kneeshaw, J.P., Penmaenmawr (Kneeshaw, Lupton, & Co.'s Limestone Quarries, Llanddulas), examined.

Mr. H. Kneeshaw, J.P.

3182. (*Chairman.*) You have heard the evidence of Mr. Darbishire?—Yes.

3183. You have been connected with granite quarries?—Yes.

3184. Do you agree with what Mr. Darbishire has said?—Yes, generally; but I would like to say that in opening a new gallery in an old quarry it is sometimes impossible to allow a space of 3½ feet between the rail of the tramway and the edge of the gallery. I think the rules which are proposed are very good.

3185. Have you any suggestion to make?—No, I have not.

3186. (*Mr. Evans.*) Do you say that there should be a space of 3½ feet when there are no men working below?—No, it is not necessary then. It might be on a gallery where there are men working below, but at another point.

3187. Where there are no men working down below you do not consider that 3½ feet is necessary?—No, I do not. Generally speaking, I agree to the 3½ feet.

3188. (*To Mr. C. H. Darbishire.*) What do you think of the rule as to the 3½ feet?—I think that is very fair. If a waggon got off the road the man might go over with it.

3189. (*Mr. W. A. Darbishire.*) What is the average weight of a quarry waggon?—They weigh from two tons to two tons and a quarter.

3190. And what is the width of the rail?—It is 3 feet at our quarry and 2 feet at Mr. Farren's. With regard to riding up inclines, I should like to say that although we put up notices, as is done in other quarries, that the men are not allowed to ride up for the purpose of throwing the responsibility upon them if they happen to meet with an accident, I think it would be exceedingly hard upon the men to make them walk up an incline perhaps of half a mile to their work when the chances of an accident are so exceedingly small.

3191. (*Mr. Richmond.*) You do not think it is desirable to make a rule that they should not go up?—No, I do not. With regard to the health of the quarrymen, I may say that they live to a great age, 70 to 80 as a rule, and after giving up sett-making they break macadam.

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3192. Are the wages higher or lower in your quarries than they are in the slate quarries?—I should think they are about the same.

3193. Is there anything else you would like to say?—There is the point as to sending the men into shelter at blasting time. It would create a great deal of friction between the men and the agents if anything were done more than is done at present. Our men are exceedingly intelligent, and it is not like a colliery where a man has not the proper means of testing matters. You should not insist upon a man going into shelter at blasting time.

3194. But they do go as a rule, do they not?—Yes; but if a man does not go, what then?

3195. Then he ought to be told to go?—But if a man thinks that by going behind a rock he is perfectly safe no one ought to interfere. It seems to us sufficient that a notice is put up, and it is understood that he is to go.

3196. You do everything short of actually carrying the man into the shelter?—Yes. The manager ought not to be expected to do anything more. He cannot go and take hold of the man and put him in the shelter.

3197. If I came to your quarries and found a man not under shelter at blasting time I should want to know something about it from him?—Quite so.

3198. That is, if there was a shelter provided?—You must let the men take the responsibility on their own shoulders.

3199. (*Mr. W. A. Darbishire.*) In any rules that may be made you do not want the workman to be relieved of responsibility, but rather that his responsibility should be defined?—Yes, that is it.

3200. (*Chairman.*) You do not at the same time propose that the manager should be exonerated from all responsibility?—No, not within reasonable limits.

Mr. J. P. Faichney

Mr. J. P. Faichney (manager of Messrs. Kneeshaw, Lupton, & Co.'s Limestone Quarries, Llanddulas) examined.

3201. (*Chairman.*) You have heard the evidence which has already been given?—Yes.

3202. Do you agree with what has been said as to the sett quarries?—Yes, except as to the blasting.

3203. You mean that the details of the arrangements as to blasting should be made at the different quarries to suit each particular quarry?—Yes.

3204. And that they should be submitted to, and sanctioned by, the inspector to a certain extent?—Yes.

(*Mr. J. W. Raynes*, of Messrs. Raynes & Co.'s, Limestone Quarries, Llanddulas, added: We cannot have stated times for blasting at our quarries.)

3205. (*Chairman to Mr. Faichney.*) You have signals at blasting time?—Yes.

3206. Do you ever dismiss the men for not complying with the rules?—No.

3207. You have provision in the rules which you have just handed in for fining them?—Yes, but that is never done now. It used to be done, but it created bad feeling, and we stopped it.

3208. (*Mr. Evans.*) Are your quarries near to the public road?—The public road leads to them.

3209. What steps do you take to warn the public?—We have two men there.

3210. Have you got two men, one on each side?—We have two if it is a bad place, but only one as a rule.

3211. What is the distance that you think they ought to be kept clear in order to be safe?—The face of the rock is a long way from the road.

3212. How far is the road from where you are blasting?—Where we have the ordinary blast is close up to the highway in one bank. There are other banks which are 60 or 80 yards away, and the top bank is 130 or 140 yards away.

3213. How do you do with the people on the highway; are they willing to obey you?—Yes.

3214. (*Chairman.*) Are your quarries worked in the same way as the stone quarries?—In sinks.

3215. The same as galleries really?—Yes.

3216. And how many have you?—We have three.

3217. (*To Mr. Raynes.*) How many sinks have you at your quarry?—Ours is one at present, but we are commencing another.

3218. (*To Mr. Faichney.*) Are your rocks not more brittle than those of the stone quarries?—Yes the top is, but not the bottom.

3219. And it is more apt to fall away?—Some of it, but it is not so loose as all that.

3220. You do clear the ground away when you find the place dangerous?—Yes, I have done so myself, but the men will not always do it.

3221. How many men are there employed at your quarries?—From 250 to 270.

3222. (*To Mr. Raynes.*) What number of men do you employ?—About 150, but it varies.

3223. (*To Mr. Faichney.*) Have you had any fatal accidents during the last 10 years?—Yes, we have had one.

3224. (*To Mr. Raynes.*) Have you had any?—Yes, several.

3225. Do you know the number exactly?—No, but we have had three in the bottom of the quarry during the last few years.

3226. What were the causes of those accidents?—The first was taking down some stone, and he lost his balance and fell over. In the second case they were firing, and they must have put the fuse in the powder without putting anything on the top of it. The fuse blew the man up. In the third a piece of rock fell in the night-time, during the time they were loading a vessel.

3227. And I suppose the man had no room to get clear away?—Yes, he had, but he did not do so. A man who was working with him got clear away.

3228. (*Mr. Richmond.*) One accident happened to E. Davies?—Yes.

3229. In June 1888?—Yes.

3230. That was in consequence of his not carrying out the 20 minutes rule?—Yes.

3231. The next case was Robert Lewis, in November 1891?—Yes.

3232. He fell?—Yes.

3233. And W. Williams was the next case?—Yes.

3234. That was in 1892?—Yes.

3235. And he fell whilst blasting?—Yes.

3236. And then there was another accident at the end of the year?—Yes, a piece of stone fell on his leg, and he was carried home and died afterwards.

3237. (*Mr. Williams.*) You build your ricks close to the road, do you not? Is there room for a man to pass by there?—Yes, there is.

3238. Do you allow sufficient space for a man to pass between a waggon and the ricks?—Yes.

3239. (*Mr. Evans.*) I suppose that most of your accidents happen in connexion with blasting?—No. In one case a man fell from the rock, and in another a stone fell on a man's leg.

3240. So that there are two connected with blasting, and two not?—Yes.

3241. (*Chairman.*) Have you any suggestions to make, or any recommendations?—If you can make the men to take more care of themselves than they do it will be a good thing.

3242. But have you anything to suggest?—No, I have not.

3243. And you have no recommendation to make further?—No, none.

3244. What is the depth of your galleries?—The greatest depth we have is 180 feet.

3245. And what is the smallest?—The other one is about 45 feet, the most shallow one.

3246. And what is the length?—The top is 230 yards.

3247. Is that across from one edge to the other?—No.

3248. How much is it from edge to edge, say?—About 40 or 50 yards.

3249. (*Mr. Faichney.*) Are the men employed at the limestone quarries healthy?—Yes, they are very healthy men. I think they are stronger men than those at Penmaenmawr.

3250. Have you any ambulance class at your quarry?—Yes, we have.

3251. (*To Mr. Raynes.*) Have you any ambulance class at your quarry?—Yes, just the same. *Mr. J. P. Faichney.*

3252. (*To Mr. Faichney.*) Have you lectures going on now?—They have finished them. 9 Aug. 1893.

3253. But you will have another course of lectures commenced, I suppose?—Yes.

3254. And you have men who can use the "first aid"?—Yes.

3255. Have you had occasion to find that they have been of service?—Yes, they have been very useful on two occasions.

Mr. Edward Peters, of Buckley, near Chester, examined. *Mr. E. Peters.*

3256. (*Mr. Richmond.*) Where do you work at present?—At the Elm Colliery, Buckley.

3257. What is the name of the company?—George Watkinson & Co.

3258. I thought you were working in a brickworks?—No.

3259. It was about a brickworks that you wrote to me?—Yes, and I know something about quarries as well.

3260. You have worked in both, have you?—Yes, I have worked in quarries between 12 and 13 years.

3261. In which slate quarries?—In the Festiniog district.

3262. You mean as a miner?—Yes. I want to give evidence as to what I have observed from time to time.

3263. Evidence as to what you have observed above ground?—Yes.

3264. (*Mr. Darbishire.*) With regard to quarries or clay pits, or what?—With regard to the thing generally.

3265. (*Mr. Richmond.*) You know what our inquiry is, to see whether means can be taken to reduce the number of accidents in the open quarries?—Yes, so I understand. I have observed from time to time that open quarries, both slate, stone, and clay, are under the Factory Act, and I find that the Factory Act has no provision for them, and that the men are therefore unprotected.

3266. Have you ever worked in a clay pit at Buckley?—No, but I have been reared there, and have taken a good deal of notice of what goes on there.

3267. But you have never actually worked in them?—No, I have not.

3268. What is that you wanted to give evidence about; what special points?—The clay pits are worked on a most unsafe system.

3269. What are the dangers?—The chief danger is that they are worked in one pit.

3270. And not in galleries?—Yes.

3271. What depth do you say they work in at Buckley?—From 20 to 30 yards, and over that a little.

3272. But that is not nearly as deep as they work in many of the stone quarries?—No; but you must remember that clay is a very different thing from stone.

3273. Then what you object to is the depth that they work the clay pits?—Yes, and I say it is dangerous. Although I have not worked myself in in a clay pit, I have observed the dangers which the men are liable to.

3274. What else is there that you object to?—There is the question of explosives and their storage. That is not properly attended to.

3275. Are you speaking now of the magazines?—I am referring to the explosives used in the quarry.

3276. But are you speaking of the magazines, or of the explosives actually in use?—Of the explosives actually in use.

3277. Then what have you to say about them?—When there is a class unprotected by an Act of Parliament they get careless.

3278. (*Mr. Darbishire.*) You think they are not so careful unless they are under an Act?—That is my opinion. The men have a tendency to get careless. They leave the explosives without being under lock and key; it is possible, and I am afraid that children have been going down into those clay pits and taking detonators away, and afterwards injuring themselves with them.

3279. Where are the explosives kept?—I do not think they have a proper place in the clay pits to keep them.

3280. (*Mr. Darbishire.*) Do you know that they have not?—Yes, I do.

3281. (*Mr. Richmond.*) What kind of explosive do they use in the clay pits?—They use gunpowder and high explosives.

3282. But they must be kept somewhere?—Yes, the stock is kept somewhere, but it is possible for a workman, if he wants two or three charges, say, of gelatine or any other explosive, to take more than the quantity he actually requires, and therefore what he has to spare he leaves on one side, maybe, carelessly.

3283. (*Mr. Darbishire.*) Does he leave it on one side?—It is possible.

3284. But does he leave it on one side, or does he take it to the magazine?—There have been accidents, and children have been seen with detonators

3285. (*Mr. Williams.*) Can they say where those detonators were got from?—As far as they could gather they were from the clay pits.

3286. (*Mr. Richmond.*) You say you complain, first of all of the mode of working the clay pits?—Yes, that is one thing.

3287. And you complain that there is not sufficient care taken with regard to the explosives?—Yes, I do.

3288. Have you got any other point with regard to the dangers in a clay pit which might be remedied?—I consider that there should be an examination.

3289. An examination of what?—Of the pits.

3290. (*Mr. Darbishire.*) Who by?—By some person who would be considered qualified.

3291. (*Mr. Richmond.*) Have they not someone who is manager at the pits at present?—They have not got one who can go over the present faces.

3292. Do you know of your own knowledge what the practice at the Buckley clay pits is?—Yes.

3293. They have some one in command there, such as an overlooker?—No.

3294. Every man does not do what he likes there?—Of course there is a charge-man.

3295. Then there is a man who looks after the place?—Yes, he gets about 2*d.* a day extra pay.

3296. Does he not look to see that the place is examined?—He cannot.

3297. (*Mr. Evans.*) Are there any accidents which have taken place in consequence of the want of examination?—Yes, there have been.

3298. Can you refer to any?—Yes.

3299. (*Mr. Darbishire.*) Where at?—At Davison & Co.'s.

3300. (*Mr. Richmond.*) Which of Davison's works?—The Top works.

3301. Do you know what the man's name was?—No, I forget, but I can get it for you.

3302. When did it happen?—Two years to last New Year's Day.

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3303. (*Mr. Darbishire.*) On the 1st January 1891?—Yes, or thereabouts.

3304. What was the accident caused by?—By a fall.

3305. (*Mr. Richmond.*) Do you know what caused he fall?—It was most likely thawing at the time.

3306. Was it a case of undermining at all?—Yes, and change of weather as well.

3307. Is there any other accident that you know of?—Yes, I remember several in my time.

3308. (*Mr. Evans.*) Can you give us the names of the men?—No, not just now.

3309. (*Mr. Richmond.*) How many years back are you speaking of?—That accident was two years ago.

3310. How long have you been at Buckley?—I was reared there until I was 14 years of age, and I have always taken an interest in Buckley.

3311. But how long have you been there this time?—For about three years.

3312. So you would not be able to speak from your own personal knowledge of accidents for more than three years?—Yes, I can, because I used to visit Buckley very often.

3313. Do you say, as a matter of fact, that there has been a large number of fatal accidents?—The number of men working in them is not large, and there have been too many accidents if they can be avoided.

3314. (*Mr. Evans.*) How many are there working now in the clay pits?—In the one that I am referring to there are from six to ten.

3315. Do you think that is the number that do work in that pit?—Yes.

3316. (*Mr. Darbishire.*) And how many accidents have there been during the last 10 years to those six or ten persons, I mean fatal accidents?—I cannot say how many, but there have been several, and Mr. Richmond knows it.

3317. During the last 10 years?—Yes.

3318. In this particular clay pit?—No. I know of no other accident in that one place except the one I have already referred to, but it is more through good luck than good management that there have not been more accidents.

3319. (*Mr. Williams.*) Are there many clay pits in your district?—Yes, a great number.

3320. And are you speaking now of one in particular, or of the whole lot?—I am speaking about them generally.

3321. How many are there working in the clay pit where the accident happened?—There are from six to ten.

3322. Is that the largest number of men in any one clay pit?—No, there may be 12 to 14 in some of them.

3323. Do you know how many there are working in all the clay pits in that district?—Yes, there are about 110 or 120 I should think.

3324. (*Mr. Richmond.*) There are 110 men working in the clay pits altogether in the Buckley district?—Yes.

3325. Can you remember any more accidents there?—Yes, I can remember two at Catherall's.

3326. Not within the last 10 years?—No, hardly. Two were buried under a fall there and one was underneath for some days.

3327. (*Mr. Evans.*) What would you consider a safe gallery in a clay pit?—In that kind of ground it ought not to be more than from 6 to 8 yards, so that a man could examine it daily.

3328. Do the galleries follow each other in tiers?—They work it in one face now.

3329. (*Mr. Williams.*) There are no galleries there at all?—No.

3330. And that is your complaint?—Yes.

3331. If it does not fall upon the men they want it to fall?—Yes.

3332. (*Mr. Richmond.*) The practice is to undermine it and let it fall?—Yes, that is so, and it is a very dangerous practice.

3333. They do not bring it down from the top?—No.

3334. (*Mr. Darbishire.*) What other way would you suggest?—I would suggest that it be taken in galleries.

3335. But you would still undermine it, would you not?—No.

3336. What would you do?—Take it down from the top.

3337. Have you any idea of the difference of cost?—It might be a slight increase in the cost.

3338. But how much do you think it would be per ton?—I do not think it would be more than five or seven and a half per cent.

3339. What do you suppose is the present cost of working it on the undermining system?—Half a dozen men can produce about 40 to 50 tons a day.

3340. That is about eight tons a piece?—Yes.

3341. (*Mr. Williams.*) How much could they do if they worked on your plan?—They could do the same.

3342. Then there would be no increase in the cost?—No, I do not think there would, but we will say there would be an increase of seven and a half per cent.

3343. (*Mr. Darbishire.*) Have you ever tried it?—No, I have not.

3344. (*Mr. Evans.*) Are they compelled to blast the clay sometimes?—Yes.

3345. But not always?—They do as a rule.

3346. (*Mr. Williams.*) Is it a clay or a kind of marl?—Some part of it is brittle, but there are some hard stratas. Taking the face as a whole, it is brittle.

3347. Is your complaint a general one throughout the clay pits, or a special one?—It is general throughout the district.

3348. Do the men generally complain?—No, they are simply agricultural labourers, and a very low class of men.

3349. Have you been working on this clay at any time?—No; a man who has not had practical experience does not consider it dangerous.

3350. Do you propose that there should be some better mode of storing explosives?—Yes.

3351. Have you any other suggestion to make?—No.

3352. The two points you have mentioned are what you consider the most important?—Yes. The cause of the men being careless is, in my opinion, the fact that the Act does not touch them.

3353. (*Mr. Evans.*) Do you know of any accident that has happened in connexion with explosives?—There was a little boy who had his hand blown off a month ago.

3354. You know that of your own knowledge?—Yes, I saw him.

3355. Did he work in the clay pits?—No, he was playing about. Children from 12 to 16 years of age are in the habit of going there to play after the men leave off work.

3356. (*Mr. Williams.*) Is it a fact that this boy got the explosive at one of the clay pits?—It is supposed so.

3357. Then it is not known as a fact?—No, not properly, and if it is known it is kept quiet.

3358. (*Mr. Richmond.*) Where was the boy when the explosion occurred?—On some ground near the clay pit.

3359. Near whose clay pit?—Near Hancock's.

3360. Which of them?—The Lane End Works. I was in company the following night with a man who said he had seen his brother bringing in some of these detonators.

3361. Or do you mean caps?—No, detonators. The men sometimes calculate that they want more detonators than they really use, and the spare detonators are not carefully kept afterwards.

3362. Are there any other points that you want to call the attention of the Committee to?—Those are the chief ones.

3363. (*Mr. Williams.*) You say the men who work in those clay pits do not know the danger they are in?—No, they do not.

3364. They go there from the agricultural districts round about?—Yes.

3365. Do any of them go there without any experience?—Yes.

3366. They do not commence when they are young?—No. They cannot do that very well, because boys cannot do the work, it is rather heavy work, and requires a man to do it.

3367. You say there is no method at all about the work?—No, there is none whatever.

3368. (*Mr. Evans.*) And the method you want them to introduce is to work in galleries 6 or 8 yards deep?—Yes. If they worked on that system it would be much safer.

3369. And you say they should not be more than from 6 to 8 yards deep?—No, they should not. A man could then examine them.

3370. And you wish a rule to be drawn out that they shall keep within that?—Yes.

3371. And that detonators should not be allowed to be kept loosely about?—Yes. The Mines Act should be made to apply to them.

3372. (*Mr. Williams.*) What employment do you follow now?—I am a colliery fireman.

3373. How long is it since you left slate quarries?—It is three years.

3374. Where were you working then?—At Oakeley's Quarries.

3375. How long were you working in slate quarries altogether?—For over 12 years. *Mr. E. Peters.* 9 Aug. 1893.

3376. Have you been working in slate quarries anywhere else besides Festiniog?—I have worked at Maenofferen in the open.

3377. Have you ever worked at Craig Ddu?—No.

3378. (*Mr. Evans.*) Have you any suggestion about open stone quarries?—No, but I should like for the Act to be made to apply to them.

3379. (*Mr. Williams.*) You want supervision over all?—Yes, and that by a practical man.

3380. (*Mr. Evans.*) Can you give us any special suggestions about open quarries except that they are to be supervised by practical men?—Yes, that is one.

3381. Can you suggest anything else?—They should not be allowed to work the galleries too close to each other.

3382. (*Mr. Richmond.*) Are you now speaking of the width of the galleries?—Yes, from the top of one gallery to the top of the other.

3383. (*Mr. Evans.*) What would be the result of that?—It would save lumps of rock falling over on to the men working in the under-gallery.

3384. Have you anything else to say?—No.

3385. (*Mr. Darbishire.*) Were you a quarryman at Mr. Oakeley's quarry?—Yes, I was on the rock.

3386. (*Mr. Richmond.*) Was it the Palmerston Quarry?—Yes. I have been employed as explosives expert for two years.

APPENDIX III. (B.)

FIFTH DAY.

At the Home Office, Whitehall, S.W., Friday, 3rd November 1893.

PRESENT:

Mr. Frank N. Wardell in the chair.	Mr. W. A. Darbishire.
Dr. C. Le Neve Foster.	Mr. W. J. Williams.
Hon. W. W. Vivian.	Mr. J. J. Evans.

Mr. H. S. Richmond, *Secretary.*

Dr. William Ogle examined. *Dr. W. Ogle.* 3 Nov. 1893.

3387. (*Chairman.*) This Committee has been appointed by the Secretary of State for the purpose of inquiring into the condition of slate and stone quarrymen generally throughout the country, not only with reference to the occurrence of accidents, but also with respect to the healthiness of the occupation, whether it is a healthy one or whether it is not; and it was thought desirable and advantageous to the Committee that you should give us any information upon that question that you are able to, as to the effect it may have upon the workmen, from dust, for instance, in connexion with slate quarries?—No distinction has been made in the official mortality returns between slate and stone quarrymen; because it was found impossible to separate them. In Carnarvonshire and Merionethshire the quarrymen would be mostly slate-quarriers, but a man would often be returned simply as a quarryman, without statement whether in slate or in stone.

3388. The Committee is not confined to slate quarries, but to all quarries, and, therefore, that is all the better?—All the evidence I can give relates to mortality, not to disease by itself, and the causes of mortality.

3389. Not from accident?—Mortality from all causes, and mortality from certain special causes. There is no doubt that the slate and stone quarrymen have a very high mortality as compared with other trades, not with all other trades, but with most other trades. The figures I shall give relate exclusively to males between 25 and 65 years, an age which has been selected as being the real working period of life—if you take people before 25, there has not been time for their industry to have much effect upon them, if you take them after 65 your figures get unsatisfactory because of the number of persons who retire from bad health—consequently, all the figures which I can give relate to the mortality of men between 25 and 65 years of age. If, then, you take the mortality of "all males" in England and Wales to be represented by 1,000—a convenient figure—you will find that the mortality of most industries is below 1,000, because "all males" include all the cripples and people who are unable to work, so that their mortality is rather high. But the mortality of stone and slate quarrymen is considerably above 1,000. I can give you the exact figure, it will be 1,122; that is to say, practically 12 per cent. higher than the mortality of "all males" of the same ages, including those who are sickly and those who are unable to work. That is a very high mortality.

3390. You cannot separate the two, can you; you cannot give the mortality of slate and stone quarrymen irrespective of disease?—I can cut out from that

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1,122 the deaths from accident. Of that 1,122, 148 are from accidents. That is to say, of the 1,122 deaths of the stone and slate quarrymen between 25 and 65 years of age, 148 are due to some form or other of accident.

3391. That actually brings the mortality from disease to less than 1,000?—Yes, to less than 1,000.

3392. What I mean is, that there would not be anything like the 12 per cent.; the excess would not be so great as 12 per cent., if you take away the accidents from the stonemen?—The accidents to "all males" out of the 1,000 deaths are 67. Take away those from the 1,000, and you have 933. 933 will be the disease mortality of "all males," and 1,122 minus 148 will be 974, and represent the disease mortality of quarrymen.

3393. When you have disease you get a very small excess?—A considerable excess; 41 on 933, that is a considerable difference, you see.

3394. What I mean is this, it is not half of 12 per cent.?—No, but you must remember that the men employed in most industries, for instance, shopkeepers, farmers, labourers, gardeners, fishermen, commercial travellers, grocers, bakers, shoemakers, builders, and so on, have a comparative mortality figure much lower than 1,000. This 974 is high, and it is especially high if you take another thing into consideration, and that is that a weakling will not become a quarryman. Originally they would start with a body of comparatively picked men. A poor weakling would become a tailor, or a clerk, or something or other in a sedentary occupation, whereas those men who take to stone quarrying, or mines, or any of those industries which require a considerable amount of muscular development, will be strong men at the beginning, so that, irrespective of their occupation, you would expect them to have a lower death rate than the men in other trades. I think there can be no doubt, that the mortality, both from accidents and disease, is very high among the stonemen and slate quarrymen in the aggregate. It is not as high as in several other trades, but it is high.

3396. (*Mr. Darbishire.*) The weaker man would be cut off, you think?—Do you mean cut off by disease.

3396. No, by the nature of the occupation?—I presume that he would.

3397. (*Hon. W. W. Vivian.*) I have some number of men in my employment, and I do not agree with you, as amongst them I have several weakly men at work; I can with safety say that I have over 100.—Out of how many men employed?

3398. I can with safety say that it is considerably over 100, and so weakly are they that I doubt if they would have got good employment say in Manchester, where I was before I came to Wales.—What kind of per-centage of the weakly to the strong is that?

3399. It is a small per-centage.—Is it a smaller per-centage than would be the case in other industries?

3400. I employ about 2,500 people, men and boys, and I consider, taking these quarrymen all through, that they are not a very strong class of men.—I bow to your experience. My statement was an *a priori* statement, I have no personal knowledge of the matter. I assumed that a weakling would not become a quarryman, but would take to some other employment, such as tailoring, or some other sedentary occupation, but I may be mistaken; it was an assumption on my part.

3401. (*Mr. Williams.*) I think there is a great deal in that, and it applies to other occupations besides quarrymen, that the weaklings are put to something else?—I should have thought so, but I have no real knowledge of the matter.

3402. In the case of a weakly boy who was not strong enough to do quarry work your statement may not be an error?—Quite so.

3403. (*Hon. W. W. Vivian.*) Here again I do not agree. In my district an attempt is made by nearly every quarryman to get his son into the quarry, whether he is a weakling or not?—Is that so?

3404. (*Chairman.*) If it is not overstocked?—Would not that young fellow, the weakling, get out of the occupation before he was 25 years of age?

3405. (*Hon. W. W. Vivian.*) How do you mean "get out"?—If a weak boy went into the quarry the hard work would find him out before he got to 25, would it not?

3406. No, he may continue with his father, working possibly in the shed or elsewhere.

3407. (*Chairman.*) Will you proceed with your statement?—Speaking then of accidents, of all of the trades and the industries, about which I made inquiry, there were only three that had any notable mortality from accidents, and the quarrymen were one of those three, the other two being miners and fishermen, who are, as far as disease goes, and even in their general mortality, including accidents, excessively healthy men, having a mortality of only 797, again compared by the standard of 1,000, and that notwithstanding that their accidents are even higher than the accidents of the quarrymen, their accident mortality being 152, whereas that of the quarrymen is 148. These may be looked upon as practically the same figures. The only other industry that has a high mortality is that of miners. I cannot tell you anything about the causes of accidents, I simply take them in the aggregate. I should say, again, that I believe that those figures for the mortality from accidents are below the reality, owing to the mode in which the verdicts at coroners' inquests are given; a great many coroners put a quarryman down simply as a labourer, and in this way he gets missed out. The same applies even more in the case of miners, and I have no doubt whatever that if we had the actual figures the mortality by accidents would be greater among the miners and among the quarrymen than is represented in this table which I have constructed. I do not know that I have anything more to say about accidents.

3408. We will take it altogether.—I then pass on to their mortality from sundry diseases. I have only taken out a limited number of diseases, but in corroboration of what I said before was an assumption on my part, that quarrymen as a rule would be strong men, I would say that their mortality from most diseases is very low. But their mortality from certain diseases which they would be likely to be specially liable to is very high, namely, from phthisis and from diseases of the respiratory organs. Their mortality from phthisis and diseases of the respiratory organs is one of the highest. I take phthisis and diseases of the respiratory organs as one; and I take as a standard fishermen, because a fisherman is a very healthy man and lives in the open air and is not exposed to dust. If you take the mortality from phthisis and from diseases of the respiratory organs to be in fishermen 198, the figure for the quarrymen will be 582, which is extremely high; it is one of the highest, there are higher ones but it is one of the highest, and there can be no doubt in my mind that the main cause of that, I do not say the entire cause, is the inhalation of stone dust.

3409. You are separating stone from slate, are you not?—No. I am speaking of quarrymen of all kinds. I find that if I take the chief dust-inhaling occupations, and treat them the same way as I have been treating the quarrymen, that is, if I consider their mortality from phthisis and diseases of the respiratory organs, all those trades that are exposed to such dust as that to which quarrymen are exposed, have high mortality from those diseases. Fishermen, as I mentioned before, I take as a standard, as following an occupation that is free from dust.

3410. Would you mind instancing the trades?—I shall come to them. The mortality figure for fishermen was 198. If you take agricultural labourers, farmers, and gardeners you will also find extremely low figures; but when you come to those who work in dust of various kinds you get much higher figures. I will take you, please, first of all to the dust of wood, carpenters and joiners—they have a mortality represented by 337, against 198 for fishermen. Then

come persons who are exposed to the dust of wool, cotton, and so forth; they have very high figures, 462 for the wool manufacture; 543 for the cotton manufacture. I do not attribute this entirely to dust, I attribute it in great part also to their working in ill-ventilated factories, with a very great degree of heat, and I believe that the difference between the mortality of those engaged in the wool manufacture and those engaged in the cotton manufacture is not so much due to the difference of the dust as to the differences in the other conditions that attend their occupation. Then we come to quarrymen, 582, higher than any of those I have mentioned yet; of course they inhale considerable quantities of sharp stone dust. There is another trade in which the same occurs, and that is the earthenware manufacture. The pottery makers have a most appalling mortality from phthisis and lung diseases, about 1,118, and I know of nothing to which I can ascribe it, except the inhalation of stone dust.

3411. (*Mr. Darbishire.*) What does the earthenware manufacture mean?—The potteries.

3412. You are not familiar with the process, are you?—There is a very large amount of dust in the Staffordshire potteries in some of the processes, and their lungs get clogged up to a considerable extent with these matters. There are different branches of the trade, which I cannot separate; in some of them the mortality from other causes than lung diseases is high; but the great mortality in the potteries is from this affection of the lungs by the dust. I would say that another set of men who I presume inhale stone dust are the Cornish miners, and they have a mortality from these diseases of 1,148, the highest of all. In all these cases—whether of quarrymen, or potters, or Cornish miners—I attribute a large portion of the excessive lung mortality to the inhalation of stone dust.

3413. You say Cornish miners?—I mean all the miners in Cornwall.

3414. Are you referring to out quarrymen, or underground miners?—The group would contain a certain number of surface miners doubtless. It includes all the men in Cornwall who were returned as miners.

3415. And underground men are included?—Underground men are included, quite so. There remains after stone dust another very dangerous form of dust, and that is metal dust. The only two occupations that I could get a sufficient basis to calculate upon, were the file-makers and the cutlers in Sheffield, meaning by cutlers, all persons who are engaged in knife and scissor making in Sheffield and parts round there; their lung-mortality figure was 760; and that of file makers, 783. So that, I think, we have abundant evidence that the inhalation of dust produces these lung diseases, and that the kind of dust which is least dangerous is that of wood or flour, which is extremely soft and not irritating; it is worse when you come to stone and slate; and, probably, worst of all when you come to metal. Under other diseases than those I have mentioned, the quarrymen have not high mortality figures. There are some diseases that are commonly produced by drink. The quarrymen show no sign of excess under these. Their mortality from diseases of the liver, for instance, is less than that of "all males." Disease of the liver is probably the best I can take as illustrating the effects of drink; If you take the mortality of "all males" in England, of the ages I have specified, from liver disease, to be 39, that of innkeepers, publicans, and other dealers in drink, comes out at 240, eight times as much. That of the stone quarrymen is only 25; of course, this does not mean that the men may not drink a great deal. I should think they did probably, but the amount of drink that does harm is not measured simply by the quantity you drink, but by the quantity in relation to the exercise and the work you do, and I presume that the work of the stone quarryman is sufficient to render the amount of drink he takes practically such as not to do much harm to his liver. The returns of alcoholism itself are extremely uncertain, because it is disguised very often in the statement of the death certificate. I do not suppose, however, that it would be disguised any more in the case of stone or slate quarrymen than anybody else, probably less, the mortality for "all males," being represented 10, that of stone and slate quarrymen from alcoholism is only five, from which I infer that these men certainly do not die of the diseases which are ordinarily produced by drink. Whether they drink much or not, I do not know.

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3416. The average is low compared with the average in other occupations, I suppose?—It is lower than the average. You are speaking of alcoholism itself?

3417. Yes?—We will look for the mortality figures under alcoholism in some of the trades, and I will first take innkeepers. There it is, 55—five and a half times the average. Then, coming to cab and omnibus servants, it is 33; that is about the next highest. Brewers have the next highest figure, 25; commercial travellers, 23; butchers, 23; and so on. There is no evidence whatsoever that these quarrymen die of disease from drink. They die of accidents and diseases of the lungs and phthisis, but not in more than average degree from any other diseases; they do not commit suicide, which is another test of drink. The suicide figure is not high among quarrymen. So also with diseases of the nervous system, which cover a multitude of diseases, many of which may be produced by drink. The mortality of stone and slate quarrymen from nervous diseases, is not high, being 83, against an average of 119 for all England. In fact, it appears to me that the evidence from the mortality figures tends to show that the quarrymen are a set of strong men, who live a healthy life with the exception of the inhalation of dust and the liability to accident. I do not know that I have anything further to say on that point.

3418. Can you give us any information about the imperfect sanitary arrangements?—No, I have no information on the subject.

3419. In the quarry?—No, I know nothing about that at all. I know nothing about how the quarrymen live. The data on which my calculations are based are, firstly, the number and ages of quarrymen living in 1881; secondly, the number and ages of the quarrymen who died in the three years, 1880–2; and, lastly, the proportion of deaths of quarrymen from certain selected causes, as derived from a large sample. I have no data about the sanitary conditions under which they are living.

3420. With reference to the figure you have given relating to accidents, upon which you have based your statistics—so far as you can tell they may be somewhat imperfect—I should like to know where they have been obtained?—When the census of 1881 had been finished I had, of course, the returns of the number of quarrymen living from 25 to 65 years of age in the whole of England and Wales. The death registers of England and Wales were examined for 1880, 1881, and 1882 and beginning to end, and all the deaths of quarrymen, with their ages were taken out. From these data I calculated the mean annual death rate in the three years 1880–2. That only gave the death rate, without the causes of the deaths. It was impossible to take out all the deaths with all their causes. I therefore did that by sample, and I find my sample consisted of 1,124 deaths of quarrymen with their causes. I divided out my death rate by the proportions I obtained from that sample. Have I made myself intelligible?

3421. (*Chairman.*) Quite?—That is how those figures were got. The death rate itself, the total death rate, is based upon the mortality for three years, but the division of that death rate into its separate causes is based upon a sample which consisted of 1,124 deaths.

3422. The actual returns of accidents are returned from whom—do you test them?—In the death register every death is registered, and the cause of each death is registered. In the case of death from

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accident there would have been an inquest, and the verdict would say death from accident, and sometimes the kind of accident would also be given. That is the coroner's return, the verdict of the jury, and it is entered in the death register. The only flaw, in the statement of the deaths from accident is caused by the coroners neglecting to state exactly the occupation of the deceased, and contenting themselves with some general term, like labourer.

3423. That is what struck me. In my own district I know of coroners in mentioning the word labourer also preface it by the word "colliery"?—Of course we should put a man so described down as a coal miner, but I am afraid that they do not always do that. It is a very old complaint, and it has been made many times. The Registrar-General has no authority over coroners. In the case of medical men, if there is any doubt what the meaning was, the Registrar-General can make inquiry, but coroners are under this office, and not under the Local Government Board, or the Registrar-General. As this is a committee of the Home Office, I think it would be a very good thing if it did something to stir up coroners to make their returns a little more useful for the public service. As a rule, in my experience of the last 13 years, the returns made by the coroners are as bad as any returns we get in mortality.

3424. That is a matter we might consider?—Very well.

3425. (*Hon. W. W. Vivian.*) You do not know what are the districts for which you have obtained these figures?—No.

3426. I ask this because in certain parts of Wales the mortality is higher than in others?—The sample was taken with a good deal of care. I took out the samples myself, and I took some from the north and some from the south, so that I might get it distributed equally all over England. As a rule I took some from every county, and in proportion to the number that were found by the census to be working in those counties. A very large number would come out of Wales, because there are a very large number of quarrymen there. But everything was done to make the sample a fair one, both by taking it from different parts of England, and also by taking it from the returns at different times in the year. Of course, if you took all the sample in the winter you would have a much higher mortality from lung disease, and if you took it altogether in the summer you would get a low lung mortality. The sample, therefore, was taken from all seasons of the year.

3427. Do you consider that in these chest diseases you have named there is not a possibility of their being produced by the mode of living, or inter-marriage?—The diseases of the respiratory organs?

3428. I mean those diseases that you mentioned?—I see no reason to believe it, more than that the accidents were produced by it. But I am afraid I have not quite followed your question.

3429. Is there not a possibility that these diseases you have named amongst quarrymen may be caused by their mode of living, or from their inter-marrying?—If their mode of living involves their working in dust.

3430. Leave out the diseases from dust altogether?—No, I do not think there is any ground for such a supposition at all. But I do not know myself how a quarryman lives.

3431. (*Mr. Williams.*) I was going to ask the same question as Mr. Vivian—can you give us the returns for the various counties?—No.

3432. Then you cannot distinguish between a stone quarryman and a slate quarryman?—No, you see you cannot make trustworthy calculations of death rates without having a considerable basis, and if you make a death rate for each kind of quarryman, you would have some enormously high and some extraordinarily low from casual circumstances; and that is the reason why I took stone and slate quarrymen together. Besides the difficulty of separating them, this plan gives a larger amount of basis on which to form your induction. In the case of the coal miners, who are very much more numerous than the quarrymen, I was able to take them in counties, because in such a county as Durham you get such a large number of them that you have a sufficient basis. The slate quarrymen are confined almost to two counties, and their number in those two counties is not sufficient for a basis of calculation.

3433. Then I thought we might get that, and then the work is not exactly the same as stone quarrymen, and we might get something out of you in that respect?—No, I cannot separate them at all. Of course Merionethshire and Carnarvonshire practically represent the slate industry, but there are also a certain number of stone quarrymen, in those two counties.

3434. Yes, especially in Carnarvon; do you attribute the two causes to slate dust principally?—Slate dust and stone dust. It would be very desirable, if possible, to separate the stone from slate quarrymen, but I do not think that you will be able to do it, I mean if you attempt to do that you would not get a sufficient basis for a reliable inference.

3435. Do you think that working in a damp and high place on a mountain would affect their health?—The Carnarvonshire and Merionethshire mountains would be very healthy, but on the other hand there is also exposure to wet, and doubtless the exposure to wet would assist in producing these diseases to which they are found to succumb.

3436. You do not find that they are getting worse with the diseases than they used to be formerly?—I am not quite certain. Might I, however, read a little bit about stone and slate quarrymen, from my report for 1881. "The death rates of these workmen, though much "lower than those of the miners in Cornwall, are extremely high, as also they were in the previous "record, and give a comparative mortality figure of "1,122. The excess is due partly to accident, under "which heading the mortality approximates to that "of coal miners and is almost the same as that of "fishermen, but mainly to phthisis and diseases of the "respiratory system, under which headings together "the mortality is 582, and not far from double that of "coal miners. On the other hand, it is not much "more than half that of the Cornish miners, this "difference being probably due to the advantages "enjoyed by the quarrymen, who, though exposed to "the inhalation of stone dust like the Cornish miners, "yet work much more in the open air, and not in "the ill-ventilated and over-heated atmosphere of "deep mines. Their mortality from diseases of the "nervous and of the circulatory systems, and "generally from other causes than accident and lung "disease, is low, and rivals that of coal miners and "of agriculturists. Like coal mining quarry work is "an occupation to which as a rule only robust men "betake themselves." That was the view I took, but I have been told to-day it was erroneous.

3437. I believe you are quite right. I know that it is the fact that the impression generally upon parents is that if they have a weakly boy they think of trying to get some other employment for him?—Just so.

(*Hon. W. W. Vivian.*) There you and I absolutely differ, Mr. Williams.

3438. (*Mr. Williams.*) I am only expressing an opinion.

(*To the Witness.*) What do you say?—I would say this, that a question was asked me whether the mode of living, irrespective of their work, might not produce these diseases. I cannot conceive that it could do so, because they show a low mortality from other than lung diseases; their mode of life therefore must be such as to lower their mortality from other diseases whilst it raises it from diseases of the lungs, which is a condition of things which I cannot understand.

3439. (*Mr Evans.*) Do you think that drinking a good deal of tea affects their health to some degree?—I really do not know whether they drink tea or not.

3440. They do?—The only diseases arising from drinking tea in large quantities would be those of the

nervous system, or diseases of the digestive organs, and their mortality from both of these causes is low.

3441. Can you tell us which is the most injurious, the dust of hard stone or the dust of slate?—I cannot say, but if you look at the dust of stone and the dust of slate under the microscope you will find sharp angular points, while in the dust of coal, which does not affect miners very seriously but to some extent, you will find rounded corners, and it is not nearly so irritating. I attribute the high mortality of quarrymen from lung affections, and the comparatively low mortality of coal miners from similar diseases, to the difference in the hardness and angular character of the respective dusts.

3442. Do you find those people subject to any disease that is generated by improper houses to live in?—I have no evidence to show that. Of course, if they live in very bad houses, that let the rain in, and are damp and so on, that might assist in producing disease of the lungs, but whether they do so more than other people I do not know. I have no reason to suppose, in my ignorance, that stone and slate quarrymen are worse housed than coal miners, for instance; in fact, from such houses as I have seen in Merionethshire and Carnarvonshire, they appear to have good substantial buildings to live in.

3443. I should not think that they do live in worse houses at all, but a question has been asked about the dwellings of the quarrymen, whether they were sufficient, and I thought if any diseases were generated by such things that you could see it there?—If they are living in bad houses, then I should say that life in those bad houses would help to produce mortality from diseases of the respiratory system. Whether they do, is a matter I have no knowledge of.

3444. You have nothing before you to prove that they live in bad houses?—Nothing at all.

3445. (*Hon. W. W. Vivian.*) I should like to read these remarks to you. Here is one from a doctor who has given evidence?—Is this a part of the evidence before this Committee?

3446–7. This is a question asked by Dr. Foster, at page 5 of our first day's evidence. Question 72: "The "men also suffer from disorders of the digestive "system?—Yes, they do. (*Q.*) Is that to any extent "due to their drinking such a lot of tea?—(*A.*) Yes, "and it is particularly due to the mode they have of "preparing the tea. (*Q.*) Then how do they prepare "it?—(*A.*) Men who have a cow or two prefer to "take tea in their cans in the morning rather than "milk. They leave it in the cans, and drink out of "them at intervals throughout the day. (*Q.*) They "drink tea that has been standing all day long?—"(*A.*) Yes. (*Q.*) Without milk?—(*A.*) Yes, generally. They could get plenty of sweet milk or "buttermilk to drink, but they have got into the "habit of drinking tea at every meal. They have no "relish for any liquid but tea. It is tea all day long. "(*Q.*) Does that stewed tea contain a lot of tannin?—(*A.*) Yes, there is no doubt it does. (*Q.*) And "does that turn the coat of the stomach into leather?—(*A.*) It produces a low kind of inflammation. "(*Q.*) So that it does affect their health?—(*A.*) "Yes, it brings on constipation, which is very prevalent among the quarrymen. (*Chairman.*) It also "brings on dispepsia, does it not?—(*A.*) Yes, and "that is the chief disease amongst the quarrymen."—Whether they suffer more than other persons from dyspepsia, I cannot say, but I can say that they do not die from that disease. I look to my figures; I have already spoken of their liver disease mortality as being low. There is another head, "Other Diseases of the "Digestive System." I do not know what the figures will turn out to be, but we will look at them. There the figure for quarrymen is 38, and that of "all males" is 38, exactly the same—it chances to be exactly the average. There is no proof whatsoever that they die of diseases which this gentleman says originate from the drinking of tea. There is no proof that they die from diseases of the digestive system more than males generally.

3448. I see at Question 265, another doctor, John Williams, is asked: "In regard to their general health, "is there anything in which they are engaged in "their ordinary occupation which you think affects "their health?—(*A.*) I do not think there is. If they "could provide themselves with better food in the "quarry it would be better for them. The worst of "it is that they take a heavy meal at night and go to "bed soon afterwards. They are subject to palsy on "that account, and also congestion of the brain"?—That is not a result that finds support in these figures, which are probably taken on a larger scale than the local doctor would have at his command. Remember these figures that are given here are based upon a much larger amount of data than any single individual could possibly possess from his own observation. *Dr. W. Ogle.* 3 Nov. 1893.

3449. This number 1,124, you take as your basis to obtain your returns?—That was the size of the sample used for the division of the death rate into its several causes. I can tell you what the size of the basis was for getting the general death rate. The calculation of the death rate of quarrymen from all causes, is founded upon 72,465 years of life between 25 and 45 and 33,759 between 45 and 65. That is an amount of data that no single doctor practising at a quarry could possibly have. I am not the least supposing that he was not doing the best he could from his data.

3450. But you stated they are not satisfactory?—No results derived from insufficient data can be satisfactory.

3451. Then at page 16, Question 268, Dr. Williams is asked: "In your experience do you find the dust "arising from their occupation at all injurious?" (this is another doctor). He replies, "I do not think "that it is in the least." Then, at Question 271, Dr. Roberts was asked, "Whether he thought the "mode of life or the occupation of the quarryman "was most injurious. What is your opinion on that "point?—The occupation is not." Then the next question is, "You think the quarrymen's health "depends more upon the manner in which the man "lives?—Yes, in a great measure, especially in "regard to the question of meals." That is the same thing?—I think that this gentleman can hardly be aware that their mortality is high owing to diseases of the respiratory organs, or he would not attribute it to taking a heavy meal.

3452. (*Mr. Williams.*) Talking about having a meal at night, that is quite wrong, the medical man is quite wrong?—I do not know whether they do so or not, but if they do it would not have the effect of producing disease of the respiratory organs, but diseases of the liver and digestion and so forth, of which they do not die.

3453. (*Hon. W. W. Vivian.*) Here is another, page 40, the 15th line: "The men are no doubt well "above the average stature, but their muscular "development is very poor, and their health is not "good. Indeed, they are far from doing justice to "the healthy character of their work and the healthy "position of the quarry. The cause of this is not far "to seek, and is due to the conditions under which "the work is performed. These conditions are: "1, food; 2, clothing; 3, sanitation; 4, weather; "5, early marriage"?—Of those there is only one which would produce disease of the respiratory organs, and that is weather. Of course, if they are exposed largely to bad weather, so far they are exposed to to a cause which produces disease of the lungs, but their food, their clothing—does it mean that they are insufficiently clad?

3454. Yes, I take it to mean they do not clothe themselves properly for their work. This is a doctor who has had considerable experience in hospitals and so on?—Is it your experience that they are badly clothed?

3455. Speaking for myself, I do not think that they do clothe themselves satisfactorily?—Not warmly enough? I was considering whether it would produce disease of the respiratory organs. Is their clothing not warm enough for their work?

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3456. I should say in some cases, yes. In other cases he puts on too much clothing, not having had sufficient food?—I do not know whether I may ask whether that applies to quarrymen more than other workmen, because these figures are comparisons between quarrymen and other workmen. Is it not a general truth concerning the labouring classes, that they clothe themselves badly, and that they feed badly.

3457. I think that the Cornish miner is the best clothed for what he has to do?—Is that so.

3458. (*Dr. Foster.*) He is working underground, and he has a change of clothes; a certain set of clothes that he works in and another set that he goes home in?—There is one difference between this doctor's evidence and that I have given, and that is that he is dealing with disease and I am dealing with death. It may be perfectly true, I do not know anything about it, that quarrymen are extremely liable to dyspepsia and other digestive ailments, but those diseases do not kill them, and I deal only with mortality.

3459. (*Hon. W. W. Vivian.*) Do not these diseases affect their mortality?—Apparently not.

3460. "It is indeed astonishing that the quarryman "is as healthy as he is, but he has to thank the "locality and character of the work, and not himself. "Inter-marriage is also far too common. Near "relations and tuberculous people inter-marry freely, "and the quarry supplies a convalescent home for "the resulting families when they are old enough and "fortunate enough to be taken in"?—He does not mean that early marriage produces diseases of the respiratory organs I suppose. He would not mean that clearly.

3461. (*Mr. Darbishire.*) I should like to ask whether what are the diseases of the respiratory organs include tubercular consumption?—I have given you the mortality from diseases of the respiratory organs and from phthisis taken together, and tubercular consumption would come under phthisis.

3462. Tubercular consumption would be phthisis?—Yes.

3463. But I mean tubercular consumption, something that is hereditary and making a man die at about 35 or 40?—That is begging the question it seems to me, as to whether phthisis is hereditary.

3464. Of course I am in the dark?—Tubercular phthisis is generally supposed by medical men to be due to a certain microbe. When you speak of it being hereditary you are begging the question.

3465. Then I want to know, in these returns from which the item of phthisis or respiratory disease is returned as the cause of death, whether the registrar would return tubercular consumption as that?—Certainly. The deaths ascribed to tubercular consumption would go down among those deaths which I have taken in combination.

3466. I want to know whether sleeping with closed windows in a bedroom with too many in the room, and never opening those windows, would not produce that kind of consumption?—It would tend to favour its development.

3467. And, further, whether an excellent quality of food, such as we had evidence of in Scotland, would not counteract any influence of that kind tending to diseases of the lungs, that is soup and porridge, and soup and meat, instead of tea and bread and butter?—That is so; doubtless bad food and bad housing would favour the development of tubercular disease and diseases of the respiratory organs.

3468. I want to know whether smoke has the same effect upon this disease, is it to any extent similar to that effected by dust, smoke in a mine or underground, gas from explosions, and things of that kind?—A long inhalation of smoke I suppose would be injurious to the lungs. Smoke is a form of dust, but I should suppose that ordinary smoke would not be so deleterious, consisting as it would do of particles of soft matter, as would be the inhalation of the harder dust of stone. But I have no doubt that the constant living in smoke would be injurious to the lungs.

3469. But I want to ascertain whether there are not a great many causes which produce this disease of the lungs?—Doubtless, but you have this evidence. Other people are exposed to these causes besides stone miners. You find those miners exposed to one special cause, the inhalation of dust, and they die from a disease which certainly can be produced by that; surely the natural inference is that that high mortality from this disease is due to that cause which can produce it, and to which they are exposed, but that that is aided by other causes is perfectly possible.

3470. I want to point out that by the nature of the occupation of the quarrymen, it is not quite one third of them who have anything to do with dust at all. How do you account for it?—Then the mortality of that third must be enormously high to raise up the average. If it be true that only one third of the stone quarrymen are exposed to the inhalation of dust, and if the quarrymen die in large numbers from disease caused by dust, the mortality of this one third must be something tremendous.

3471. I take the liberty to ask whether there are not other causes besides dust?—There are other causes to which they and those in other industries are also liable. What are the special causes to which you allude?

3472. I allude to sleeping in closed bedrooms and without ventilation, and by reason of this they are naturally prone to, and are unable to triumph over, that which they are naturally liable to owing to weak constitutions?—If a stone miner is more prone to sleep in an overcrowded and unventilated bedroom than the coal miner, or persons in other trades, doubtless that would be a partial explanation of his high mortality. But I have no reason to know, but it may be the case, that stone miners are given to this bad habit more than other persons are.

3473. And that is our evidence, that they are exposed to bad ventilation in their houses, and to insufficient food, and I want to know whether those are the subsidiary causes. Have you compared stone miners in this respect with other trades?

3474. We have compared it with other quarrymen in other parts of the country, where they have lived under better conditions?—And you have found the mortality from lung disease less.

3475. We have not any returns; the only statement is that they are generally healthy. I should think there must be something?—I only answer that I do not know the conditions under which quarrymen live. I have no reason to suppose that the quarreyman shuts up his windows and sleeps in an overcrowded room, or feeds worse than a person who is engaged in other occupations. If that is so, if you say that he does so, that is another matter.

3476. I used to live in Lancashire, and know the quarries and the quarreymen, and they certainly do live better than those in Wales?—But it is of the quarrymen compared with men in other that we are speaking.

3477. I mean that I do not think that the whole of it is attributable to dust, because that really does not account for it; it does not make the number out. If I understood you rightly, you attribute it almost entirely to dust?—Even people who are not exposed to dust die of diseases of the respiratory organs to a certain extent; fishermen, for instance,—the figure for them is 189—and I do not attribute, in the case of fishermen, the mortality from diseases of the respiratory organs and phthisis to the inhalation of dust, and consequently I do not say that the sole cause of producing this in a quarryman is dust, but the difference between the lung mortalities of the fisherman and the quarryman is, to my mind, mainly due to the fact that one does and the other does not inhale dust. I do not say that all the deaths of the quarrymen from diseases of the respiratory organs are due to dust, of course. I should have thought myself that the fisherman lives probably with his windows shut quite as closely as the quarryman, but I do not know whether it is so or not.

3478. They do so in their boats when they sleep in their boats, and that is the cause of it, I have no doubt?—I do not know how they sleep.

3479. (*Dr. Foster.*) One of our objects is to draw up rules and regulations for promoting the health and safety of the quarrymen; do I gather from you that the most important rules would be those to prevent accidents, more important than to prevent disease that accidents are more fatal to quarrymen than any single disease?—His mortality from diseases of the respiratory organs is very much higher than his mortality from accident, and the difference between him and the ordinary male is greater, I think, in the case of diseases from the respiratory organs than in the case of accidents.

3480. Then am I to understand that the prevention of the inhalation of dust appears to you to be more important than the prevention of accident?—It is a matter of figures. I have not made the calculation. Your question is, which causes the highest mortality. Is it not?

3481. Of course it is?—The number of deaths due to phthisis and diseases of the respiratory organs among quarrymen is 582, whereas that of "all males" is 402, an excess of 180 of mortality amongst the quarrymen from phthisis and diseases of the lungs as compared with the ordinary male. The excess from accidents is 81, and I am therefore of opinion that it is more important to prevent diseases of the respiratory organs, the excess of which is 180, than to prevent accidents, the excess under this heading being only 81.

3482. Apparently it is inherent to his occupation, and it is more deathly than the accidents inherent to his occupation?—That is so.

3483. (*Mr. Darbishire.*) Will you let us have that figure again?—Out of an equal number living there would be of "all males" 402 deaths from diseases of the respiratory organs and phthisis put together, whereas for the miners there would be 582; that is, that there would be 180 deaths more among the quarrymen than among the average males of the same age. In accidents there would be 67 deaths for the average males of those ages, and 148 for the same number of quarrymen; and the difference there would be 81, so that you would have 180 extra deaths from diseases of the respiratory organs and only 81 from accidents.

3484. (*Dr. Foster.*) The conclusion from these figures is that some measures should be adopted to prevent the quarryman inhaling the dust?—If it can be done, but I should presume that accident was more easily prevented than inhalation of dust. But I do not know how that may be.

3485. Do you know of any good measure for preventing a quarryman from inhaling dust?—No. I have no practical knowledge of the matter at all. I suppose there are things to be worn over the months, respirators; but I do not know whether they could or would wear them.

3486. With regard to mortality in other occupations, is it not the fact that a physician or surgeon is at exactly the same mortality rate as the quarryman?—The physician and surgeon has a very high comparative mortality figure. I will tell you exactly, 1,122.

3487. Is it not the fact also that the cabman, the bargeman, the carter, the law clerk, the butcher, the hairdresser, the bookbinder, the glass manufacturer, and the plumber all have higher death rates than the quarryman?—You have the figures. I have no doubt that you are quoting them correctly. As to most of them, I know that is the case.

3488. It is so in the case of the cab driver, the hairdresser, the bookbinder, and the hotel keeper?—The inn keeper and the brewer, and all those who are much exposed to drink, have tremendously high mortalities, and I am afraid the doctors are amongst those as regards mortality.

3489. With regard to the bookbinder, what do you say?—He works in a very unwholesome atmosphere of steam and heat.

3490. (*Mr. Richmond.*) These figures appear to be for quarrymen; do they include in "quarrymen" the men who are stonedressers?—Are not stonedressers called masons?

3491. There are stonedressers in a quarry?—He would be included if he were returned as a quarryman.

3492. There are stone quarrymen and slate quarrymen, and those who work in sheds and dress the stones?—Those would be included if they so state; but if a man put himself down simply as a stone dresser he would not. The same thing would happen with regard to their deaths; there would be the same cause of error, the same proportion in the death register as in the census return.

3493. There may be very much more dust in a sawing shed than there is in gaining the slate or splitting the slate?—Yes. But I know nothing about it.

3494. (*Mr. Williams.*) But those in the pit engaged in getting the slates out are more exposed to the dampness and wet, again?—Yes. I daresay it may be so.

3495. So that one counteracts the other?—It is only an inference of mine that the excessive lung mortality of quarrymen is due to the dust. All that I know is that the mortality of these men is very high, and especially high from diseases of the lungs, and that in that respect they resemble other people who are subject to the inhalation of stone dust. From that evidence I draw the inference that the quarrymen's high mortality from lung disease is due to the stone dust.

3496. (*Mr. Richmond.*) Have you seen the return of Dr. Roberts, of Festiniog, who gives the percentages of the deaths amongst slate miners as against slate quarriers?—No, I have not.

3497. (*Chairman.*) Dr. Mills Roberts, of Llanberis, in giving evidence was asked whether he had made any comparative statements showing the deaths from phthisis, and so on, and he said, "No, I have been "resident in various parts of England, in different "hospitals, and I am simply looking at the average "quarryman here compared with the average work-"man elsewhere. Phthisis is not more prevalent "here than anywhere else. (*Q.*) That is your "opinion?—(*A.*) Yes. (*Q.*) Have you formed any "opinion as to why it has increased of late years?—"(*A.*) No; but it will go on increasing unless they "have better food. (*Q.*) Then you think the em-"ployment has nothing to do with it?—(*A.*) No; it "is the . . . . healthiest possible employment." Of course, that was the evidence of a local doctor?—They die of something.

3498. In all the figures and returns from which you have quoted is Scotland included?—No, simply England and Wales.

3499. It does not include Scotland at all?—No.

3500. Of course our returns include Scotland?—I have nothing to do with the registration of Scotland. My information is confined to England and Wales. I presume that even in Scotland the dust produces this disease, from my recollection of the life of Hugh Miller, who was a distinguished quarryman. I think he was a teetotaller, or at any rate, drank very little. His fellow workmen used to jeer at him for not drinking. They said drink was the only thing to keep the dust off the lungs, and that without he would die. As a matter of fact he did die, from phthisis, and I am afraid that that prophecy and that fact must have caused a good deal of drinking afterwards.

3501. (*Dr. Foster.*) Are any of these figures published?—The figures I have given as to the mortality in different industries are published in the Decennial Reports made by me in 1885. The aggregate mortality from all causes, of men in different occupations was also given by Dr. Farr on a small basis both in 1861 and in 1871. I give here, on page 25 of the Repor ,in the first column, those experiences as they

Dr. W. Ogle.

3 Nov. 1893.

have been put together, and if you look there you will find that the mortality was very high amongst slate and stone quarrymen in 1860, 1861, and 1871, so that the previous experience corroborates the results which I obtained on a larger scale in 1881. I do not think there is any possible doubt whatsoever that the mortality of these workmen is extremely high, and I do not think that there is any doubt that the mortality is high owing to diseases of the respiratory organs and owing to accidents.

3502. (*Chairman.*) And the mortality is higher in respect of diseases of the respiratory organs than from any other disease? — The difference between the mortality of quarrymen from diseases of the respiratory organs and that of average men is greater than the difference of their mortalities from accidents.

3503. That is what we understand?—So that if you could by any possible means stop the diseases of the respiratory organs amongst quarrymen you would save more lives than by putting down accidents.

3504. Quite so; that is what we gather from those figures?—Yes.

3505. (*Mr. Williams.*) I would like to submit one table prepared by Dr. Mills Roberts, and I should like to have your opinion, Dr. Ogle, upon it?—I would like, before entering on a fresh topic, to say one word more. Of course, nobody can claim for figures prepared in this way mathematical accuracy, but whatever error there is, is an under-statement. Some deaths of quarrymen, as also of miners, and especially some deaths from accidents, are omitted from the calculation; because the quarryman or miner is oftentimes simply described in the certificate as a labourer. So that whatever error there is in these figures that are quoted is an error of under-statement and not of over-statement.

3506. But, Dr. Ogle, will you take the evidence of the first day into your hand, and turn to Quection 708?—The list of deaths of quarrymen which you have put into my hand cannot possibly be a fair sample. It is no more possible for quarrymen than for anybody else to be working to those ages. Here you have quarrymen dying at the age of 89. Does a man go on working up to 89 years of age at quarrying.

3507. (*Hon. W. W. Vivian.*) I have some about 75. I have got over 100 pensioners?—But the first certificate of death I see here is at 77, and then I find in succession 89, 80, 89, and 63.

3508. But these are, as I understand it, counterfoils from certificates of death?—But they must have been selected. It would certainly appear, otherwise, that it would be far better to be a stone quarryman than, let us say, a civil servant.

3509. The counterfoils were, I understand, read right through the book. I have got 100 pensioners who average, I think, about 80 years of age?—Well, I see that 23 of those dying from diseases given in this Question 708 die of old age.

(*Mr. Darbishire.*) That return was not meant to be a specimen of the whole deaths, but merely as an indication that the occupation of a quarryman does not prevent his reaching old age.

3510. (*Chairman.*) That was so?—Quite so. (*A manuscript table was here handed to the witness.*) I have taken from this list all the deaths between 25 and 65 years of age to see how far that would corroborate the statement made by me that the mortality of quarrymen of those ages from lung diseases is exceptionally high as compared with their mortality with other things. There are 19 deaths altogether. Of those, 10 are either from phthisis or lung disease, more than half the total mortality, but there is something very strange in these figures, because no less than six of the other nine deaths are from cancer.

3511. (*Hon. W. W. Vivian.*) Cancer is, I understand, rather common?—But cancer between the ages of 25 and 65 in men is a comparatively uncommon thing, and here there are no less than six deaths out of 19 attributed to it, that is to say, it is stated that one-third of the men between the ages of 25 and 65 died of cancer. If that is so it is a most astounding thing.

3512. You will find that cancer is pretty frequent, if I remember rightly, speaking without book?—Stone mining I do not suppose produces cancer. I do not question the accuracy of this, but it is plain that the number of cases given there is not sufficient to justify any inference; if you find that one third of of the cases die from cancer, you may be quite sure that the sample is quite inadequate.

3513. I will ask you to refer to Questions 709 and 710: "Are those cases that you have attended to?—(*A.*) "Yes, in Dinorwic. (*Q.*) Is there anything to account "for the large number of deaths from cancer?—(*A.*) "No; it is more prevalent in the stomach; their diet "predisposes them to a low inflammatory condition, "and probably that accounts for it." What do you say with regard to that?—So far as any inference at all can be drawn from that sample, it corroborates the statement I have made that the mortality of quarrymen from phthisis and lung disease is enormous, because you have more than half the deaths from all causes due to those diseases; but I would draw no inference from such scanty data.

3514. (*Chairman.*) Except that it bears out your own figures, the total?—So far it does.

3515. And as to diseases from the respiratory organs too?—Yes.

3516. (*Mr. Richmond.*) Is the death rate amongst masons' stonedressers high?—The mortality of builders, masons, and bricklayers put together from phthisis and lung disease is high, being represented by 453; but it is not nearly so high as that of quarrymen or Cornish miners. Of course they work much more in the open air.

3517. And working in the open air, they would not be subject to dust?—Not so liable to inhalation of dust as those who work underground. Still their mortality from phthisis and lung disease is a good deal above the average.

3518. (*Dr. Foster.*) A good deal above the average?—Yes, but not so much as that of quarrymen.

3519. Perhaps the masons are taken out separately?—No.

3520. (*Mr. Darbishire.*) A mason is a man who dresses stone, not a builder in any way. The same name does not mean the same thing in different parts of the country?—We are obliged to take them as we get them.

3521. A mason in Scotland would be called by one name and in another part of the country he would be called by another name?—That may be so. But every one who calls himself a mason, or a builder, or a bricklayer has been included by me in the group. It would no doubt be interesting could one separate the different branches of this and of other industries. But the data at my command were not such as would allow of this being done.

The witness withdrew.

Adjourned.

FIELD VOLES (SCOTLAND).

REPORT

OF

THE DEPARTMENTAL COMMITTEE

APPOINTED BY

THE BOARD OF AGRICULTURE

TO INQUIRE INTO A

PLAGUE OF FIELD VOLES

IN

SCOTLAND,

WITH

MINUTES OF EVIDENCE AND APPENDICES

AND

A Copy of the Minute appointing the Committee.

Presented to both Houses of Parliament by Command of Her Majesty.

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Copy of the Minute appointing the Committee.

The Board propose that a Departmental Committee be appointed to inquire into and report upon the circumstances attending the existing plague of Voles in some of the Southern Counties of Scotland; and to ascertain, either experimentally or otherwise, as the Committee may determine, whether any, and if so what, preventive and remedial measures can be adopted, and under what conditions those measures are likely to be of value.

The Board further propose that the Committee consist of the following gentlemen viz. :—

Sir Herbert Eustace Maxwell, Bart, M.P., Chairman,
The Right Hon. the Earl of Minto, K.T.
The Rev. John Gillespie, M.A.,
Professor D'Arcy W. Thompson, B.A., and
Mr. Walter Elliot.

The Lords Commissioners of Her Majesty's Treasury have agreed that the expenses of the proposed Committee should be defrayed from the Vote for temporary Commissions.

Mr. James Edmund Harting, Librarian of the Linnean Society, will act as the Secretary to the Committee.

Approved and ordered,

(Signed) Henry Chaplin.

Board of Agriculture,
28th May 1892.

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REPORT.

TO THE PRESIDENT OF THE BOARD OF AGRICULTURE.

SIR,

THE Committee appointed on 28th May 1892 to inquire into and report upon the circumstances attending the plague of voles in some of the southern counties of Scotland, and to ascertain, either experimentally or otherwise as they might determine, whether any, and, if so, what preventive and remedial measures could be adopted, having conducted their inquiry to certain conclusions, beg to submit to your Board the following Report.

Before proceeding to the infected district your Committee received evidence from Major Craigie, Director of the Intelligence Department of your Board, who stated that the attention of his office had not been called to the existence of the plague of voles until the winter 1891–92, when it had been in existence for a considerable time. He laid before us the reports of two of the local inspectors of your Board, Mr. R. F. Dudgeon and Mr. J. I. Davidson, who, early in 1892, had been directed to inquire into the extent of the outbreak in the counties affected. Your Committee also received through the Office of Woods and Forests copies of correspondence relating to former outbreaks of the kind in England, and through the Foreign Office information of similar plagues in other European countries.

Q. 2.

App. I., p. 62.

Hereafter, your Committee proceeded to the infested district and received evidence from farmers, shepherds, land agents, gamekeepers, naturalists, and others at Howpasley on 20th June, at Hawick on 21st June, at Moffat on 22nd June, and at Thornhill on 23rd June. They also inspected the farm of Howpasley, about 12 miles from Hawick, which was said to have suffered as severely as any from the ravages of voles.

App. IV., p. 79.

NATURE AND ORIGIN OF THE PLAGUE.

The animal which by excessive multiplication has caused so much mischief on hill farms in the southern uplands of Scotland is the short-tailed field-vole (*Arvicola agrestis*). Of this vole an excellent and exhaustive account was contributed to the *Proceedings of the Berwickshire Naturalists' Club*, in 1878, by the late Sir Walter Elliot, F.R.S., which will be found reprinted as an Appendix to this Report.

App. III., p. 72.

This field-vole is at all seasons a well known inhabitant of our pastures, and may be found at all heights from the sea level to near the summits of our highest hills. The chairman of your Committee saw one in the autumn of 1891 at a height of 2,000 feet on Ben Eibhinn, in Strath Ossian. The attention of farmers and shepherds is only attracted to it when circumstances have combined to cause an abnormal increase in its numbers. One shepherd stated that when as a boy he used to find a nest of voles he would "hap" (protect) it, because it was thought rare.

Qs. 83, 528, 1118, 1538, 1565.

Q. 148.

The field-vole usually produces three or four litters a year, each consisting of from four to eight young, but in some seasons they are even more prolific, the breeding season is prolonged, young voles being observed from February to November, and the litters containing as many as ten young. Mr. Service, of Maxwelltown, a local naturalist and careful observer, mentioned in his evidence that he had observed females simultaneously suckling young and in a pregnant state.

App. III., p. 73.

Q. 1572.

The present outbreak may be traced back to the year 1888, when the voles were observed to be increasing on the farm of Glenkerry and others in Selkirkshire. In the summer of 1889 the low-lying pastures near Closeburn, in Dumfriesshire, were observed to be infested by enormous numbers of voles, which remained there during 1890, and disappeared in 1891, probably moving up to the hill pastures, where at the time of your Committee's visit they were swarming.

Qs. 3, 1900, 2 04.

Qs. 170, 217, 211, 3–7 [illegible], 1009, 1272, 1413, 1900.

Qs. 268, 529, 917, 1325, 1477, 1717, 1852, 1873, 1980, 2117.

On some of the hill farms this excessive increase was observed as early as the autumn of 1890; elsewhere, however, they attracted no attention till the spring of 1891.

The districts principally affected are the hill pastures in the north-west of Roxburghshire, the south of the counties of Selkirk, Peebles, and Lanark, and the northern part of Dumfries from Eskdalemuir by Moffat to Thornhill. The voles have also appeared in great numbers in the parishes of Dalry and Carsphairn, in the stewartry of Kirkcudbright.

App. I., p. 63.

Your local inspector, Mr. R. F. Dudgeon, has already informed you that at the date of his report he estimated that in Roxburghshire 30,000 to 40,000 acres had been affected, of which he considered 12,000 to 15,000 acres had been rendered useless; in Dumfriesshire 40,000 to 50,000 acres, and in the stewartry of Kirkcudbright 10,000 to 12,000 acres were described by him as infested by voles.

Your Committee received no estimate of the area affected in the counties of Selkirk, Peebles, and Lanark, nor had they the means of verifying Mr. Dudgeon's calculation in respect to the other counties affected, but a reference to the map accompanying this Report will show that an area not less than 60 miles in length and from 12 to 20 miles in breadth has been overrun.

Map.

Causes of the Outbreak.

The rapid increase in the number of voles to the dimensions of a plague was attributed by all the witnesses examined to one of two causes, or to a combination of both. The first of these consists in the character of the seasons. Mr. Service called attention to the occurrence of a series of dry springs in 1890, 1891, and 1892, adducing figures to show that the rainfall in these seasons was very much below the average, and therefore favourable, in his opinion, to the breeding of small mammals. The autumn of 1890 was unusually wet, producing great luxuriance of grass on the hill pastures, which afforded abundant shelter for the voles. The winter which followed, though very severe in England, was a mild one in Scotland. It will be observed that Sir Walter Elliot has traced the cause of the outbreak of voles which took place in 1876, to the unusual mildness of the four or five winters preceding that year.

Q. 1571. App. V.

Qs. 34, 172, 392, 393, 1580.

App. III., p. 75.

The second cause assigned by witnesses is the destruction of hawks, buzzards, owls, stoats, and weasels by persons interested in the preservation of game. Major Craigie had previously stated to your Board that "a preponderance of opinion amongst "farmers is reported, tracing the cause of the present outbreak to the scarcity of owls, "kestrels, hawks, weasels, and other vermin." Of the prevalence of this opinion your Committee were made fully aware, nearly every witness who was examined giving it as his belief that the outbreak was due to the destruction of the "natural enemies" of the voles. A similar view was expressed by the witnesses before the Committee of the 'Teviotdale Farmers' Club' appointed to inquire into the cause of the outbreak in 1876, but Sir Walter Elliot states that much weight was not attached to this "popular opinion . . . . because no more hawks, owls, weasels, &c., had been destroyed than usual." They had in fact (to use Sir Walter Elliot's own words) "been well nigh extirpated long before the outbreak took place."

Major Craigie's Report, App. I., p. 62.

Qs. 241, 247, 273, 292, 505, 522, 538, 565.

App. III., p. 74.

Effect upon the Pasture.

Of the damage done to the hill pastures your Committee had ocular demonstration during their visit to Howpasley farm (3,000 acres), and nothing short of personal inspection could have given them an adequate idea of the extent of the mischief. The voles had shown themselves there first in what is called the "bog" land, *i.e.*, strong marshy land either grazed or cut for hay. Having devoured the grass there, they spread to the "bent," "lea," or dry hill pasture, and to the heather, which they destroyed as effectually as they had done the grass. The stem of the grass is eaten close to the ground where it is white and tender, leaving the blade above withered and useless. Plantations are sometimes attacked, the young trees being peeled and killed, but this has not been the case so much during the present outbreak as in former years. The arable land, so far, has not been much affected, but there is no doubt from the experience of Mr. Oliver, who had three acres of corn damaged by them, that, if unchecked, they might swarm upon the cultivated ground with disastrous effect. Indeed, your Committee have information to the effect that in some districts they have recently appeared in numbers in the harvest fields.

Q. 2080–82.

Q. 86.

In walking across the hill your Committee saw numbers of voles darting about in every direction, and caught several for examination. The grass, which, at the end

of June, should have been in full flush of verdure, was lying in withered wisps over a large extent of the farm, and the heather, which is valuable for winter feeding of the stock, had suffered to a similar extent.

Effect on the Stock.

Numerous witnesses spoke to the injury to stock owing to the damaged pasture. This injury was twofold, consisting first in the low condition to which the ewes were reduced, at and after lambing, from insufficiency of food, and the consequent increase of death rate among them; and secondly, in a diminution in the crop of lambs, and deterioration in their quality.

Admitting the serious injury done to the pasture by voles, to which your Committee can testify from personal inspection, it is difficult to avoid the conclusion that the sheep dependent on that pasture must have suffered to a considerable extent. To quote Sir Walter Elliot's words, "The importance of these early grasses to flocks "emaciated by previous scanty fare, at a time when the ewes, gravid with young, "require more than ordinary nourishment to enable them to rear their lambs, explains "how disastrous any diminution in their still scanty food might prove, whether from "severity of weather, or other unusual cause, such as the swarming of the voles." But it is not easy to estimate the extent to which the death rate of the ewes was increased, or the crop of lambs diminished as the direct result of scarcity of pasture caused by the voles. App. III., p. 73.

All witnesses from the infested farms testified to the low condition of the ewes at the time your Committee visited the district, but they varied greatly in their estimate of the increased death rate. One farmer, in the Hawick district put the deaths at six per cent. above an average, while the tenant of Middlegill, and the shepherd of Medlock, both near Moffat, averred that it had been doubled. The tenant of Ettrick Hall, in the Hawick district lost 140 ewes out of 1,000, whereas the average death rate for the last five years was 45. The tenant of Nether Cassock, in Eskdalemuir, estimated the deterioration on 3,000 sheep at 2*s.* a head in 1891, and at 4*s.* a head in 1892, or 900*l.* in two years. Q. 614. Q. 1283. Q. 591. Q. 1185.

The crop of lambs appears to have been seriously diminished in consequence of the low condition of the ewes. The shepherd on Rushiegreen, near Hawick, stated that 1,400 or 1,500 ewes produced 344 lambs fewer than the average. Q. 115.

The tenant of Ettrick Hall and Nether Hall, in Selkirkshire, had only 333 lambs, whereas an average would be from 600 to 700. Q. 578.

In Dumfriesshire, the tenant of Barr, near Sanquhar, said he had only 60 lambs per 100 ewes, the average being 90. Q. 1982.

The deficiency was variously calculated at from 15 to 50 per cent. below the average.

In addition to the direct loss suffered by death among the ewes and failure in the lamb crop, there must be reckoned the extra expense incurred in hand-feeding as a substitute for natural pasture.

The tenant of Eilrig (1,100 acres, present rent 255*l.* 10*s.*) put down the extra cost of this during the winter and spring 1891–92 at 120*l.* Q. 476.

The tenant of Howpasley (3,000 acres) in Roxburghshire, calculated his extra expenditure at 144*l.*; the tenant of Ettrick Hall and Nether Hall (2,400 acres), in Selkirkshire, reckoned that he had spent 100*l.* since January 1892; while the tenant of Nether Cassock and Glenderg, in Eskdalemuir (6,500 acres) estimated the cost of hay and corn supplied during two seasons at 1,200*l.* The tenant of Kinnelhead, near Moffat, claimed to have lost 1,013*l.* in two years by deaths and cost of hand-feeding. Q. 112. Q. 574. Q. 1186. Q. 1451.

It appears that hand-feeding is never resorted to, unless in exceptional circumstances, such as a prolonged snowstorm, or a failure of pasture such as has been caused by the voles.

Of course in weighing evidence as to losses by death of ewes, and deficiency of lambs, it is necessary to take into account the character of the season. The general testimony throughout the several counties was to the effect that, but for the voles, the lambing season would have been a favourable one, both among Cheviot and black-faced stock. Only two witnesses held a contrary opinion, one an assistant in a land agent's office, the other the tenant of a farm in the Leadhills district. Q. 2187, 2200.

In order to elicit more general opinion on this subject, your Committee caused a schedule of questions to be circulated among hill farmers in districts not affected by voles.

Nineteen of these were filled up and returned with the following result as to the character of the lambing season—

Very good, 2. Good, 6. Average, 7. Bad, 4.

On the whole, therefore, it may be assumed that the lambing season of 1892 in the south of Scotland was fully of an average character, and the extraordinary death rate among ewes and deterioration in the number and quality of lambs is to be attributed to the scarcity of grass caused by ravages of the voles.

Remedies.

No concerted or systematic attempts to stamp out the plague in its earlier stages seems to have been undertaken by the farmers of the district affected, and this is the more remarkable because some of them at all events, had the bitter experience of the outbreak in 1875–76 to warn them of the serious results of allowing the voles to get ahead. Isolated efforts were made by some tenants to rid their land of voles by burning the grass and heather, by killing them with men and dogs, by turning out cats, and by poison; but the effect of such piecemeal endeavours seems to have been well nigh inappreciable. Your committee are not prepared to declare that landowners and farmers could have arrested the plague, but they hold a very strong opinion that the best chance of averting its diastrous effects would have been for all interested in the ownership and occupation of land to have combined for the destruction of the voles when they were first observed to increase.

Q. 104, 742, 1126, 1193, 1328, 1728. Burning bog land, bent, and heather, seems to be effective in driving the voles off the portions burnt. Mr. Carthew Yorstoun, Commissioner on the Duke of Buccleuch's Langholm estate, stated that he had written to every tenant of a hill farm in 1892, asking if an extension of the time for burning would be an advantage. Three-fourths of those written to replied in the affirmative, and received permission to burn from 14th April (the usual limit) to 28th. The remaining fourth said they had already burned as much as the ground would stand.

Q. 1552. It is not profitable to burn all the rough pasture on a farm, as the sheep depend on it for sustenance when snow is on the ground.

Q. 58, 255, 640. Poison has been tried with very partial success. Samples of grain treated with strychnine, and coloured red to prevent mistakes, were supplied from Germany and submitted. It is stated that good results were obtained with this in limited areas; Q. 1274–6. for instance, the tenant of Middlegill, near Moffat, holding a farm of 3,000 acres, applied this poison to a meadow of 10 acres, and thereby partly destroyed the voles. App. III., p. 76. Sir Walter Elliot quotes a letter from Sir Robert Menzies, who describes how he got rid of the voles which infested 140 acres of Scots fir plantation, by laying down half a ton of half-inch drain pipes, in each of which was placed a teaspoonful of oatmeal, mixed with phosphorus. But, for obvious reasons, the application of poisoned grain over hill farms, extending to many thousands of acres, even if practicable, would be attended with much risk to other forms of life.

Q. 753. Pitfalls, *i.e.*, holes cut in the ground with precipitous sides, are equally out of the question when a large tract of country has to be dealt with. But they have proved effectual when plantations of limited extent have been attacked. The forester at Branxholm within a week exterminated the voles infesting a plantation of six acres, by digging pits 12 inches wide at the mouth, 15 inches wide at the bottom, and 18 inches deep. These were placed at a distance of from 12 to 20 feet apart.

Q. 2092. On the other hand the head-keeper at Drumlanrig said that pitfalls had been tried without much success in the extensive plantations at that place.

Q. 1464. As a remedy on sheep farms, pitfalls were graphically appraised thus by Mr. Whittle—"How many holes . . . would it take to cover my farm of 7,600 acres, "and what would be the cost?"

The same objection—namely, the nature and extent of the ground affected—applies to the proposal of other expedients which have been resorted to in various parts of the Continent, viz., passing a heavy roller ever the ground, trampling it with cavalry, inundating it, injecting water, steam, or noxious fumes into the runs. All of these may be dismissed as wholly impracticable.

Q. 487. Large numbers of voles were destroyed on some farms by men and dogs. The vole is extremely rapid in its movements and difficult to hit with a stick. A more effective weapon is a wooden implement shaped like a small spade.

Q. 516. Q. 710. The tenant of West Buccleuch, in Selkirkshire, killed by this means 13,000 in three months on 3,000 acres; the tenant of Glenkerry (3,000 acres) employed a man who killed 15,000 in one month, or about 450 per diem. The tenant of Langshawburn hired a man with 12 terriers, who killed from 400 to 600 a day on 4,260 acres. In addition he turned out 100 cats, and by the end of June 1892, reported that there was not one vole for every 100 that there had been on his ground.

Q. 428–29. Q. 432.

There can be little doubt that simultaneous and combined action of this sort on the part of owners and occupiers, aided by timely and judicious burning *in the earlier stages of the outbreak* is the most effective method of staying the ravages of the plague. Unfortunately, not only have these exertions been hitherto isolated and intermittent, but they have been delayed until the voles were swarming over a considerable extent of ground. Q. 432.

Previous Outbreaks.

There is abundant evidence to prove that in former times not only in this country, but in many other lands, the excessive pullulation of small rodents has from time to time amounted to a plague. Sir Walter Elliot has mentioned several instances, the earliest of which seems to be recorded in 1 Samuel v. 6, when the Philistines, having carried off the ark of the covenant, were visited by disease, and their fields were overrun with swarms of mice. Sir Walter observes that "the Hebrew version, from which our "translation was made, seems to be incomplete, for both the "Septuagint and the Vulgate read: 'And the cities and fields in the midst of that "region produced mice' (or burst up and mice came forth), and there was great "'confusion and much dearth in the city'; which is confirmed by the 4th, 5th, and "11th verses of the next chapter (vi), where the Philistines presented expiatory "golden images of 'the mice that mar the land' when restoring the ark." App. III., p. 77.

A passage in Holinshed's Chronicle is worth quoting here, because it records a visitation of owls similar to that which has taken place in the Border counties during the present outbreak:—

"About Hallontide last past (1581) in the marshes of Danesey Hundred, in a place called South Minster, in the county of Essex . . . there sodainlie appeared an infinite number of mice, which overwhelming the whole earth in the said marshes, did sheare and gnaw the grass by the rootes, spoyling and tainting the same with their venimous teeth, in such sort that the cattell which grazed thereon were smitten with a murraine and died thereof; which vermine by policie of man could not be destroyed, till at the last there flocked together such a number of owles as all the shire was not able to yield, whereby the marshholders were shortly delivered from the vexation of the said mice."

Stowe, quoting this account in 1615, adds "the like of this was also in Kent." Childrey, in his *Britannia Baconica*, 1660, records another outbreak in Essex in 1648, and, referring to the former plague in 1581, remarks that it took place in "an extreme dripping warm year and a mild and moist winter."

Lilly mentions an invasion as having taken place in Essex in 1660, and Fuller, writing in 1662, says:—"I wish the sad casualties may never return which lately "have happened in this county (Essex), the one in 1581, in the Hundred of Dengy; "the other in 1648 in the Hundred of Rochford and Isle of Foulness (rented in part "by two of my credible parishioners, who attested it, having paid dear for the "truth thereof) when an army of mice, resting in the anthills, as conies in burrows, "shaved off the grass at the bare roots, which withering to dung, was infectious to "cattle. In March following numberless flocks of owls from all parts flew thither "and destroyed them, which otherwise had ruined the country if continuing another "year."

In 1754, as appears by the *London Magazine* for that year, and the *Gentleman's Magazine* (p. 215) a similar occurrence was noted at Downham Market, Norfolk.

Montagu, in the supplement to his "Ornithological Dictionary" (1813), quotes Mr. Anstice's description of a plague of mice a few years previously at Bridgewater, followed, in like manner, by flights of short-eared owls.

Other outbreaks occurred in the Forest of Dean and the New Forest in 1813–14, and are fully described in a letter from the late Lord Glenbervie, Surveyor General of Woods, printed in the Appendix to this Report. In 1836, the Forest of Dean was again infested, but there is some reason to suppose that on this occasion part at least of the mischief was attributable to the long-tailed field mouse, *Mus sylvaticus*, of which a figure is given for comparison with that of the vole. App. II. p. 79. Plate I.

Destructive visitations of voles took place in 1825, in the oak coppices of Cameron, Dumbartonshire; and in 1864–67 in the woods of Drumlanrig, Dumfriesshire, when the oak, holly and ash suffered severely, but the fir and mountain ash were spared. On the other hand, in 1863–64, on the estate of Rannoch, Perthshire, Sir Robert Menzies stated that his woods suffered severely, but that the Scots firs only were attacked. Q. 1565. App. III., p. 76.

App. III., p. 72.

Finally there was the serious outbreak on the hill pastures of Roxburghshire and small portions of Dumfriesshire in 1875–76, by which much of the land suffering under the present visitation was overrun. This is fully described in Sir Walter Elliot's paper above referred to.

Foreign countries have suffered severely under the scourge of swarms of voles nearly akin to, though some of them not identical with the British species. Simultaneously with the outbreak in Roxburghshire in 1875–76, the cornlands of

App. III., p. 76.

Galicia and Hungary were infested by swarms of *Arvicola arvalis*.

App. IV., p. 79.

During 1891–92 the province of Thessaly was invaded by a plague of rodents, supposed at first to be *Arvicola Savii*, but subsequently identified as *Arvicola Güntheri* (Danford, Proc. Zool. Soc. 1880, p. 62, pl. v.) an account of which, with the means adopted for their extirpation, will be found detailed in Appendix IV.

App. VII., p. 91.

In the American continent, also, the land is subject to similar visitations. In his *Naturalist in La Plata*, Mr. W. H. Hudson gives a graphic description of the Pampas being overrun by swarms of a species of field-mouse (*Hesperomys*), and mentions the usual concomitant of extraordinary numbers of short-eared owls which preyed upon them. In this, as in most of the instances recorded, there is evidence to show that the voles disappeared rapidly, almost suddenly, whether from stress of weather, epizootic disease, or other causes.

Natural Enemies of the Vole.

Plate IV.

No phenomenon in connection with the present plague of field-voles in Scotland has been more marked than the presence of large numbers of the short-eared owl (*Otus brachyotus*). This bird, which is distributed over almost every part of the globe, is a normal winter migrant to these islands, appearing simultaneously with the woodcock (whence it is popularly known as the 'woodcock owl') and usually departing in spring. Nests in ordinary seasons are of comparatively rare occurrence in Great Britain, but in consequence of the vast multiplication of their favourite food, the vole, these owls have not only arrived in unusual numbers, but have remained and bred freely all over the district affected, laying from 8 to 13 eggs (though Professor

Q. 215, 473, 1031, 1572, 37.

Newton in his edition of Yarrell's "*British Birds*" mentions seven as an unusual number) and rearing more than one brood. The shepherd on Crooked-stone, near Crauford, has counted 14 nests on his ground. The small wood behind the farmsteading of Howpasley presented a remarkable appearance, the ground being densely covered with the "pellets" or "castings" of owls, composed of the fur and bones of voles. Living specimens of both old and young short-eared owls were produced for the inspection of your Committee at Howpasley.

The short-eared owl differs from most other owls in that he hunts in daylight, and his operations can be observed; but there is no doubt that the nocturnal species are equally useful to the farmer in destroying small rodents, and it would be difficult to condemn too severely the foolish and cruel action of those who allow or encourage the destruction of this useful and beautiful family of birds. It is with much satisfaction that your Committee record that many landowners and game preservers seem to have become convinced in late years that owls of all sorts are not only harmless to game but most beneficial to agriculturists, and have issued orders for the preservation of these birds.

Plate III., fig. 1.

Next, and hardly second in merit, as a check upon voles and mice, comes the kestrel (*Falco tinnunculus*), and it is to be deplored that popular ignorance as to its food and habits is even greater than that which prevails in regard to owls. This bird, although possessing the long wings and dark eyes characteristic of a true falcon, is known to gamekeepers as a hawk—*noscitur a sociis*—its death warrant is a standing

Q. 673, 1582, 1585, 1806, 2046, 2174.

order in most preserves, though here again there has been some improvement, and the destruction of the kestrel is forbidden on some estates. The food of this bird is known to consist almost exclusively of mice, grasshoppers, coleopterous insects, and their larvæ, but the sort of evidence on which it is condemned may be gathered from the following answers made by a gamekeeper to questions put by your Committee:—

Q. 1680. Why did you kill the kestrel?—Well, it was an enemy of the game, of course, and that is why I killed it.

Q. 1681. How long have you been a gamekeeper?—Six or seven years.

Q. 1682. How often have you seen a kestrel take game?—Many a time.

Q. 1683. What kind of game?—Young pheasants.

Q. 1684. Had you many young pheasants at West Buccleuch?—No.

Q. 1685. Then why did you kill the kestrel?—Because they will kill young grouse.

Q. 1686. Did you ever see them take young grouse?—No.

Q. 1687. Did anybody of your acquaintance ever see them take young grouse?—No, but I have heard of their taking young grouse.

Q. 1688. Would you believe a man if he said that he saw a kestrel taking young grouse?—Yes, if he said it I would.

Q. 1689. Any man?—Yes, if he was not drunk.

It is true that one witness, a tenant of shootings, stated his belief that the kestrel is a "deadly enemy of game," that one of this species took 70 young pheasants from the coops, and was shot one evening in the act of carrying off a young pheasant. But he was not speaking from observation, but from the report of his keeper, and there is little doubt that kestrels are often attracted to pheasant coops by the presence of rats and mice drawn thither by the food prepared for the young birds. Against this may be set the evidence of the head-keeper at Drumlanrig (where kestrels are preserved by order of the Duke of Buccleuch) who said that in his experience of over 30 years he thought he could remember twice seeing a kestrel taking a young pheasant. Q. 1656. Q. 2052–56.

It will, your Committee feel convinced, be a very gratifying result of the present inquiry if it tends to persuade persons interested in game preserving that the kestrel preys not so much on game as on the vermin of the farm.

It may be observed in connection with this question of the kestrel's habits, that it is rare to find people able to distinguish between one kind of hawk and another. Few of the witnesses before your Committee were able to describe hawks otherwise than as red, blue, brown, or yellow, and it was often impossible to make out what species they intended to indicate. It is one of the peculiarities of the *Falconidæ* that their plumage varies according to age and sex. In the southern counties of Scotland the sparrowhawk (which does not prey on mice) is generally known as the "blue hawk," and the kestrel as the "brown" or "red" hawk. But an immature male sparrow-hawk has reddish-brown plumage, and an adult male kestrel has a bluish-grey head and back. Q. 89, 156, 1798.

Several witnesses deponed to an increase in hawks "since the mice came," but were unable to identify the species. No doubt they were kestrels, for other species of hawks do not commonly prey on mice, and your Committee, in driving back from Howpasley, observed five kestrels together hovering over the vole-haunted ground. In order to assist in distinguishing the useful kestrel from the mischievous sparrow-hawk, figures of the two species have been prepared as illustrations to this Report. Plate III.

Buzzards probably destroy large numbers of voles and mice, and are too heavy on the wing to do much injury to winged game; but they have become very scarce in southern Scotland owing to their destruction by gamekeepers. Q. 124, 151, 199, 232, 474.

Ravens and hooded crows have also become rare, but this cannot be regretted in the farmer's interest, as they attack young lambs, and even pick the eyes out of the weakly ewes. Moreover the rooks, which it is to be hoped no short-sighted policy will greatly reduce in numbers, have done excellent service in digging up the voles' nests and devouring the young. Q. 130, 188, 227, 229, 319, 338, 452, 644,

Mr. Service, of Maxwelltown, drew attention to a change which had taken place in the habit of rooks in his neighbourhood during the last 10 years, having "developed "most marked carnivorous habits, taking eggs, young birds, young poultry, young "hares and rabbits to an extent they never did before." Simultaneously with this manifestation of carrion crow-likehabits, Mr. Service had noted an increase in the number of rooks with feathered faces like the carrion crow which he was inclined to connect with the change in their diet. (See *Stevenson's Birds of Norfolk*, Vol. I., pp. 274–275.) Specimens of the normal bare-faced rook, and of the feathered variety were submitted, and illustrations of each are given with this report. 1572, 1820. Q. 1572. Plate IV.

This alleged modification in the habits of the rook, though favourable to the farmer, has not unreasonably brought him into evil repute with game-preservers. Q. 1574.

Amongst other birds which have been observed to prey on voles are certain species of sea-gull. Q. 792.

Stoats and weasels are among the deadliest and most persevering enemies of small rodents. They kill far more than they can devour, apparently out of sheer blood thirstiness. In woodlands and on low ground they undoubtedly do much harm to game, especially the stoat which may be easily distinguished from the weasel (known in Scotland as the "whittret") by its greater size and by the black tuft at the end of the tail, which is retained at all seasons of the year, even in winter, when the rest of the body becomes wholly or partially white. Q. 1815. Q. 222, 168. Plate II.

Adders feed readily on voles, and in July 1892 the chairman of your Committee was present when one was killed with a vole in its gullet. This was in Wigtonshire, Q. 1572.

where no abnormal increase in the number of voles has been observed. But a single adder would probably not kill more than one animal of the size of a vole in a single day—so there is no reason to extend protection to these venomous reptiles.

App. III., p. 75. Q. 165, 232, 371, 627.

Some naturalists aver that the mole preys upon voles, but your Committee, though directing inquiries upon this point, were unable to elicit any evidence tending to confirm this belief.

Your Committee deem it right to point out that the popular opinion that the excessive multiplication of field-voles is the direct result of the destruction of birds of prey, stoats and weasels, which has been admittedly great over part of the affected area, does not appear generally to be the outcome of personal accurate observation.

Q. 1572.

Your Committee are of opinion that birds and beasts of prey, even had they been wholly unmolested, would not have prevailed to avert the vole plague, though they would probably have greatly mitigated its severity, and they are confirmed in this view by the circumstances attending similar outbreaks in this country in the 16th and 17th centuries, and in foreign countries of late years. Neither in Essex, previous to the outbreak reported by Holinshed, nor in South America previous to the outbreak of field mice described by Mr. Hudson in *The Naturalist in La Plata*, nor in Thessaly, previous to that prevalent there in 1891–92, was there any check placed by man upon the multiplication of the natural enemies of these rodents.

App. IV., p. 80.

In reply to the question (*inter alia*) whether "birds of prey and other rapacious "animals have assisted to any material extent in the destruction of the voles (in "Thessaly)," Her Majesty's Minister at Athens transmitted the following reply :— "Birds of prey and other rapacious animals would never suffice to prevent the "alarming multiplication of the voles under favourable climatic conditions."

App. VIII., p. 93.

This view has been amply confirmed by the observations of the chairman and secretary of your Committee during their recent visit to the infested plains of Thessaly. Birds of prey—eagles, buzzards, kites, kestrels, and other hawks, are exceedingly abundant there, and no one thinks of molesting them. Indeed, the Turks (of whom there are about 30,000 in the province) are exceedingly kind to wild animals, and object to their being destroyed. In 1866 when that country last suffered from a visitation of field-voles, Thessaly was under Turkish dominion, and birds of prey were protected. The change from Turkish to Greek rule which took place in 1881, made no difference in this respect, yet in favourable seasons the voles multiply in spite of the presence of a very full stock of their natural enemies.

Conclusions and Recommendations.

Your Committee have reluctantly been led to the conclusion that they are unable to recommend any specific method of dealing with or putting an end to the present outbreak.

It appears to be an instance of the power which small animals are well known to possess, of prodigiously rapid multiplication under favourable climatic conditions and with a plentiful supply of natural food.

Experience shows that a combination of such favourable conditions will always tend to bring about a recurrence of the plague. That being so, it ought to be the endeavour of every farmer and shepherd to be on the alert, and report without delay to the land agent, and to the secretary of the local farmers' club, or agricultural society, the first signs of the multiplication of vermin, so that palliative measures may at once be adopted, not on isolated farms, but everywhere throughout the district.

The most effective measures appear to be periodical and timely burning of grass and heather, followed by active pursuit of the vermin by men using wooden spades and dogs. If this were promptly done in the earlier stages of the outbreak, it is quite possible that it might be averted altogether, or greatly mitigated in severity.

It is hardly necessary to point out that the proprietor of the land should be informed as soon as anyone else, because his keepers and others might be usefully employed in assisting to prevent what amounts, if unchecked, to a common calamity upon all classes connected with land.

Where plantations of limited extent are attacked, pit-falls wider at the bottom than at the top, and about 18 inches deep should be dug. The voles fall into them and cannot escape, and the ground is soon cleared of them in this way.

Your Committee cannot speak with approval of the use of poisoned grain, except where the area affected is very limited.

Nor have they been able to come to any conclusion favourable to the adoption of Professor Loeffler's method of destroying voles by means of bread saturated in a preparation of the *bacillus typhi murium*, or mouse typhus. The personal investigations

made by the chairman and secretary in Thessaly (where in May 1892 Professor Loeffler was employed at the expense of the Greek Government to combat the plague of field-voles then prevailing in that country) convinced them that the favourable reports circulated as to the complete success of the experiments have not been justified by the results. In certain parts of Thessaly the voles were reported by landowners and others to be as numerous in January 1893 as ever they were. App. VIII., p. 93.

Your Committee readily admit that when used in a fresh state, the bacilliferous fluid is an effective though somewhat dilatory poison for mice or voles, and has this advantage over mineral poisons that, as has been proved, it is innocuous to human and other forms of life.

It has also been reported by Professor Loeffler that the Scottish voles sent to him alive by instructions from your Committee have been found as susceptible of the mouse typhus bacillus as their Greek congeners. But there are three objections which in the opinion of your Committee render this method almost worthless except for employment in houses, gardens, enclosed fields, or other limited areas:—

(1.) It is very expensive; the virus supplied to the Greek Government was paid for at the rate of about 4*s.* a tube, containing enough when dissolved to treat about two imperial acres, a cost which in many instances would exceed the rent of the Scottish hill pasture. To this must be added the price of bread used in distributing the virus, which would appreciably raise the cost of the process. Thus to deal effectually with a hill farm of say 6,000 acres, would entail an expenditure of from 700*l.* to 1,000*l.*, making the remedy more costly than the evil. App. VIII., p. 94.

(2.) Mouse typhus is not contagious, it can only be communicated to those animals that will swallow some of the virus. The allegation that healthy voles will become infected by devouring the bodies of the dead has not been satisfactorily proved. That Greek voles when in captivity have been observed to feed upon the corpses of their fellows hardly warrants the assumption that Scottish voles in a state of liberty will do the same; and unless the disease were communicable from one animal to the other, it is not easy to see how the remedy could prove effective on extensive hill pastures.

(3.) The fluid loses its value in about eight days after preparation. Consequently much disappointment might ensue if, after a supply had been obtained, a fall of snow or wet weather were to interfere with its distribution over the land. App. VIII., p. 94.

The remedy which has been found most effectual in Thessaly is an injection of the fumes of bi-sulphide of carbon into the burrows. This, however, is a more expensive process than the other, besides being injurious to the health of those engaged in its application. It is, moreover, inapplicable to the Scottish vole (*Arvicola agrestis*) which does not burrow to a depth like the vole of Thessaly (*Arvicola Güntheri*), but lives in shallow runs amongst the roots of herbage.

With the under-noted exceptions, the natural enemies of the voles may be divided into two classes, viz., those which destroy the voles, and are harmless to sheep, crops, and game; and those which, though preying on voles, are so hurtful in other ways as to have no claim to preservation:—

(i.) *Vole-killers, harmless, or nearly so, to sheep, crops, and game.*	(ii.) *Vole-killers, hurtful in other ways.*
Owls of all sorts,	Foxes,
Buzzards,	Ravens,
Kestrels,	Carrion and Hooded Crows.
and the smaller Seagulls.	Great Blackbacked Gulls,
	and Adders.

Strict injunctions ought to be given by landowners that the birds mentioned in the first class should not be destroyed. Their presence in full numbers, though inadequate to avert an outbreak, would undoubtedly tend to mitigate it, and, as has been proved in the case of the short-eared owl, they have the faculty of multiplying abnormally in presence of an unusual supply of food. They are at all events most useful allies to man in combating attacks of ground vermin.

Your Committee further desire to deprecate in the strongest manner possible the use of the pole-trap for the capture of hawks. Besides the inhumanity of this device, it is indiscriminate, and harmless owls, kestrels, and buzzards are just as likely to be taken by it as are the more mischievous species.

Three animals, diligent vole destroyers, have been omitted from both these lists, because they are undoubtedly hurtful to game. The first of these is the common rook (known to the shepherds as the corn crow), of which, however, the services to agriculture are now generally recognised.

The other two animals referred to are the stoat and the weasel. Of all the smaller beasts of prey these are perhaps the most hateful to gamekeepers, and it is hardly reasonable to expect that stoats should be allowed to multiply in game-coverts, or in the vicinity of pheasant-coops. But your Committee have no hesitation in recommending that weasels, which are persistent mouse-hunters and do little damage to game, should not be molested, at least on moorlands and hill pastures, where they can do little harm and much good.

Your Committee cannot conclude their labours without expressing gratitude for the consideration with which they were everywhere received in the course of their inquiry; for the hospitality shown to them; and for the exertions made by various individuals to obtain witnesses and arrange their evidence.

HERBERT EUSTACE MAXWELL (Chairman).
MINTO.
D'ARCY W. THOMPSON.
JOHN GILLESPIE.
WALTER ELLIOT.

J. E. HARTING (Secretary).

MINUTES OF EVIDENCE

TAKEN BEFORE

THE DEPARTMENTAL COMMITTEE ON FIELD VOLES (SCOTLAND).

At the House of Commons.

FIRST DAY.

Friday, 10th June 1892.

PRESENT:

SIR HERBERT MAXWELL, BART., M.P., IN THE CHAIR.

THE EARL OF MINTO.
REV. J. GILLESPIE, M.A.
WALTER ELLIOT, ESQ.
PROFESSOR D'ARCY THOMPSON.
J. E. HARTING, ESQ., *Secretary.*

MAJOR P. G. CRAIGIE called and examined.

Major P. G. Craigie.
10 June 1892.

1. (*Chairman.*) You are the director of the Intelligence Department of the Board of Agriculture?—I am.

2. And your attention has been directed to the plague of mice in Scotland?—Yes. Perhaps I might mention first as to the date at which information was received by the Office that we had no official information until a late period of the outbreak. The attention of the Intelligence Department of the Office was first called to the plague during the course of last winter, and that was chiefly by newspaper statements reporting the unusual prevalence of what were called field mice, and the damage they were doing. Subsequently in January I had a note from a member of the present Committee, Mr. Gillespie, who is now present, calling my attention to the matter, and at a later date in the same month we received a copy of a formal resolution from the Highland and Agricultural Society of Scotland, asking the Board to make definite inquiries into the existence and causes of the plague. In consequence of that resolution, and of the steps which we had already taken less formally to obtain information, it was thought desirable to direct two of the local inspectors of the Board under the Land Drainage and Improvement Acts to make inquiry in the six Scotch counties that appeared to have been up to that date affected. Those counties were Selkirk, Peebles, Lanark, Roxburgh, Kirkcudbright, and Dumfries. The result of that inquiry may be formally communicated, I think, to this Committee in the Departmental paper which I hand in. (*Handing in a copy of Reports on the Plague of Field Mice or Voles in the South of Scotland,* see Appendix No. I.) If any points with reference to the contents or preparation of that report require explanation I shall be glad to give it to the Committee.

3. If there are any points which are relevant to the inquiry as to localities, or as to the present state of the plague, we should be very glad to have information on them?—All the information that had been received up to the date of the report is entirely embodied in the report itself. Since the date of the report there has been a certain amount of information printed in the newspapers, but there have been no further official communications to the Board, except letters, reports of meetings held and resolutions passed, including one from the Highland and Agricultural Society, suggesting a general and scientific inquiry. I wish to point out at the commencement of the sittings of this Committee that we have no complete schedule of the actual parishes now or recently affected, and the information as to areas is therefore limited to the letters which the Highland and Agricultural Society were good enough to prepare and send us, and to the parishes named by our inspectors. While I was in Scotland in connexion with this subject lately, in the course of conversation with several gentlemen who had been examining into this plague, it appeared to me that it would be very desirable that any very formal inquiry should be prefaced by some sort of statistical return as to the number of parishes in which the undue prevalence of voles has been detected, and as to the date at which the plague was first noticed in each. It appears from the printed reports which I put in that the first appearance of an undue number of voles was observed as far back as the summer of 1889, and that seems to be a material matter in any inquiry into the subject. It has thus been going on for three years—not merely a year and a half or two years.

4. In what district was that?—That was in part of Dumfriesshire. It is referred to on page 9 of the report, where it is stated by Mr. Dudgeon that the voles in the summer of 1889, "are reported to have infested "in enormous quantities the low-lying pastures in "the vicinity of Closeburn, to have remained during "1890, and to have disappeared, probably migrating "to the neighbouring hills, where they now abound, "in 1891." That is the statement in the report as to their earliest detection.

Major P. G. Craigie.

10 June 1892.

5. (*Earl of Minto.*) I thought they appeared in 1876 in Roxburgh?—I have not seen any connexion established between the 1876 attack and the present outbreak. There are a number of historical notes of former plagues which I propose to mention to the Committee, and they might be taken in order when I come to them. But with reference to the present outbreak, the earliest information appears from our reports to have dated from 1889.

6. I was told that they had always had field mice since 1876 in certain numbers?—Yes. I assume from the evidence that has been given to us already that there are always a certain number of those animals in existence.

7. (*Chairman.*) I understand you to recommend that a schedule of the affected parishes should be prepared?—It might be convenient for the Committee that that should be done. If I had been making the investigation within our department into the outbreak, I should have felt it necessary to ask for some kind of schedule of that nature, but it is entirely for the Committee now to decide whether that would help their deliberations. I have had this map marked in red on the spots specially reported as affected, but that is a very rough mode of examining into the number of parishes affected (*handing in a map*).

8. In the event of our deciding to make a systematic inquiry, would your Board be able to undertake that for us?—I do not know that there is any special machinery in the possession of the Board by which that information could be obtained better than that the Committee itself possesses. The Committee, I understand, have power under the reference made to it to determine their precise form of action and to make any such inquiry, and under Treasury authority to defray the cost of it.

9. Of course that is another matter. It is a mere question of inspectors, and how one is to get information as to the parishes. Are you to write to an individual in every parish, and, if so, to whom?—That would be a matter for the consideration of the Committee. I should myself imagine that there are local committees in several districts appointed now, and they have indicated to me that they would be very glad to give assistance. They have written formally putting their services at the disposal of this Committee, and should it be desired to make an inquiry of this nature requiring local knowledge, they would be serviceable in supplying information.

10. (*Mr. Gillespie.*) No doubt they would do so if desired. The committee of sheep farmers would undertake to procure information in any form that this Committee might point out. I am quite sure they would. Is not that so?—Yes. There is also a committee appointed by the Highland and Agricultural Society which has intimated its desire to help this Committee. They would be men of large experience on the subject, and would be willing to give information of this nature to the Committee, but if the further services of the inspectors of the Board were desired also, I should be glad to report that to the Board, and take such steps as would be necessary to get information from them. Perhaps if the Committee are going to Scotland, it would be convenient that they should examine one or two of those gentlemen who went over the ground in February last.

11. (*Chairman.*) You mean Mr. Davidson and Mr. Dudgeon?—Yes, Mr. Davidson and Mr. Dudgeon. Both of them have assured me that they would be very ready to give the evidence wanted, and to help the Committee if desired, and I am sure it would be the wish of the Board to give every assistance in getting in all information.

12. Have you come to the conclusion after receiving these reports, that the account of the devastation has been exaggerated, or the reverse?—I think on the whole the reports confirm the first impression, that a very considerable amount of damage has been done. That has been the result of my communication with many persons in affected districts, and after viewing some of the affected farms. In all newspaper statements there is a liability to a certain amount of exaggeration; but as a matter of fact, I do not think the damage stated in the official reports is at all exaggerated. One point that could not be dealt with in detail in our Inspectors' reports is the history of former outbreaks. That would be another branch altogether of this inquiry.

13. On that you have prepared some information for us I understand?—I have some information on that subject. No doubt the Committee will have access to reports on the subject in various books and scientific journals. I need hardly refer to these now, because they will be directly obtainable by the Committee. The first definite report in which we find mention of an outbreak of field mice or voles, is in Hollinshed's Chronicles, written in the year 1587 (Vol. iii, p. 1315), wherein the writer speaks of a great outbreak of the kind which took place in the year 1580. His words are "About Hallowtide last past"—that is on the 1st of November—"in the marshes of Danesey Hundred" —probably Dengy—"in a place called Southminster in "the county of Essex, a strange thing happened; "there suddenly appeared an infinite multitude of "mice, which overwhelming the whole earth in the "said marshes, did shear and gnaw the grass by the "roots, spoiling and tainting the same by their "venomous teeth in such sort, that the cattle which "grazed thereon were smitten with a murrain, and "died thereof, which vermin by policy of man could "not be destroyed, till at the last it came to pass that "there flocked together, all about the same marshes, "such a number of owls as all the shire was not able "to yield; whereby the marsh holders were shortly "delivered from the vexation of the said mice." Then there are reports in Stowe, Speed, and Childrey. Stowe, in 1615, adds to the information just quoted by saying, that something of the same sort occurred also in the county of Kent in the year 1580. Childrey, in his *Britannica Baconica*, writing in 1660 says: "It is "reported that in 1648 there happened the like again "in Essex," and there he mentions incidentally that the first outbreak, that of 1580, occurred in "an extreme "dripping warm year and a mild and moist winter." Lilly, writing in 1664, alludes to a third invasion in Essex in 1660, and Fuller, writing in 1662, uses this expression: "I wish the sad casualties may never return "which lately have happened in this county (of Essex) "the one in 1581, in the Hundred of Dengy; the other "in 1648 in the Hundred of Rockford and Isle of "Foulness (rented in part by two of my credible "parishioners, who attested it, having paid dear for "the truth thereof) when an army of mice, resting in "the anthills as comes in burrows, shaved off the grass "at the bare roots, which withering to dung, was "infectious to cattle. In March following numberless "flocks of owls from all parts flew thither and "destroyed them, which otherwise had ruined the "country if continuing another year." Then "Montagu, in 1813, in the Supplement to his "Ornithological Dictionary," says—"Mr. Anstice "assures us that a few years since mice were in such "vast abundance as to destroy a large portion of "vegetation in the neighbourhood of Bridgewater; "and in the autumn a great many of the short-eared "owls resorted to that part in order to prey on them. "They were found in the fields among the long grass." Then there are accounts, probably known to the Committee, of an outbreak in the New Forest and the Forest of Dean in 1813–14 briefly referred to in my printed report. I thought it well to make special inquiries of the Office of Woods and Forests in order to see the original records, and learn what was done then. These documents I have here; partly copies for the use of the Committee and partly original documents. Copies of extracts could be taken from the latter series of documents in the possession of the Office of Woods and Forests, and if desirable I will have all the parts relating to the outbreak of mice printed for the Appendix to the Report of this Committee. They refer to the fact that both the long-tailed field mouse and the short-tailed vole were present and doing damage.

14. That you will have done for us if necessary?—I will.

15. And we can have these extracts printed as an appendix?—Yes, if the Committee so desire, and with the permission of the Commissioners of Woods and Forests, which no doubt can be arranged for. These extracts will give details of the number of mice destroyed of each kind, and some of the reports are very interesting; but the ground referred to was apparently of a different character from that on which the outbreak is at present taking place. It was not on hilly ground.

16. The Forest of Dean being mostly forest land, is that so?—Plantations were apparently mostly affected.

17. (*Mr. Harting.*) I may mention that there is a full account of this outbreak in a letter from Lord

Glenbervie, Surveyor General of Woods, to Sir Joseph Banks, printed in the first volume of the Zoological Journal, 1825—I think that possibly that letter may be found amongst those that I have brought here. There are a number of letters from Lord Glenbervie on the file, and some arrangement will be necessary in order not to reprint the same letter twice over [see Appendix II.]. The next recorded outbreak after 1813–14 of which we have information is in the year 1836, and this was also in the Forest of Dean. That information I think is to be found in Nicholl's work.

18. (*Mr. Harting.*) Yes, I think in Nicholl's "Account of the Forest of Dean," 1858, and also in the first series of Jesse's "Gleanings in Natural History"?—Yes. It need not be reprinted in that case, as it is already in type and accessible.

19. (*Chairman.*) Is that outbreak in the Forest of Dean the last of the kind on record?—No; the last outbreak is much more recent, 1875–76. In reference to this, while I was in Scotland lately I put myself in communication with some gentlemen in the district, and with the assistance of Mr. W. M. Oliver, of Howpasley, I obtained for the use of the Committee, if it should be required, an extract of the minutes of *The Teviotdale Farmers' Club* in 1876, giving information collected on that occurrence. This document was sent to me by Mr. Carruthers the Secretary of the local committee on the subject, and I thought it might be convenient for the Committee to have it printed in the Appendix if desired. It is a paper which is rather long to read, but if the Committee wish it can be put in evidence.

20. Do you think it useful to the inquiry?—I think the particulars undoubtedly are. A great deal of the information is very pertinent to the present inquiry, and so closely represents the present state of facts that if I were writing as to what I saw myself on one of the Dumfriesshire farms I should practically use the language that I find here.

21. It should be printed and circulated and if desired made an Appendix to our Report.—Another important paper was printed by Sir Walter Elliot referring to the circumstances of the outbreak of 1876. (*See* Appendix III.)

22. (*Mr. Harting.*) That will be found in the *Proceedings of the Berwickshire Naturalists' Club* (Vol. viii, 1878), and it is extremely difficult to procure?—Yes.

23. (*Mr. Elliot.*) I have a copy I got lately for myself.

(*Witness.*) There was a copy also I think in the Library of the University of Edinburgh when I was there, and I think it would be desirable that the Committee should refer to this report.

(*Mr. Elliot.*) I have the copy to which I refer still in my possession.

(*Chairman.*) Will you let the Secretary see it?

(*Mr. Elliot.*) Certainly; I got it from the Commissioner of Police in Roxburghshire.

24. (*Earl of Minto.*) Is there anything in the history relating to the disappearance of the mice?—Yes. In the case of the early Essex plague their disappearance was attributed to the number of owls which assembled, but as to the plague of 1876 it is difficult to find any explanation of the immediate cause of their disappearance.

25. Mr. Oliver gives an explanation, does he not, about the frost and rain freezing them in their holes?—There is a special note on this in Mr. Oliver's paper, and perhaps I may read it:—"The theory, however, "which is generally accepted amongst shepherds and "others residents in the districts at the time, is that "the mice disappeared suddenly about the end of "April or beginning of May, after three stormy days "of rain, sleet and snow, immediately followed by "a severe black frost, but whether the frost reached "them in their wet holes, or whether they perished "owing to the frost sealing them up in their holes "and thus starving them to death by hunger or in "what other way they disappeared, I have no means "of knowing. I have however given all the informa-"tion at my command." A number of observers have stated that they disappeared after a season of frost late in the year.

26. I do not know whether you have noticed a letter in *The Scotsman*, from Major Wardlaw Ramsay, referring to the appearance of a plague of mice in Burmah, where it is said there were millions, and that they suddenly disappeared?—I observed the letter: but we have no official information from Burmah on that subject.

27. But there was an official inquiry held in Burmah, was there not?—Yes, and there is information in a recent work by Mr. W. H. Hudson of an outbreak of a somewhat similar character in La Plata.

(*Mr. Harting.*) And in Greece.

28. (*Chairman.*) You say, "A preponderance of "opinion amongst farmers is reported, tracing the "cause of the present outbreak to the scarcity of "owls, kestrels, hawks, weasels, and other vermin." I suppose it may be admitted that the scarcity is comparatively recent; that is to say, in the earlier outbreaks, (notably those in the sixteenth century) it does not appear that there was any such scarcity. There is no reason why any such scarcity should have existed at that period, is there?—There is no mention of or probability of such a scarcity then. But I understand the preponderance of opinion on this point now to mean rather that the destruction of the field voles has been retarded rather than that their advent has been caused by the absence of birds of prey and other natural enemies. The destruction of the mice may have been retarded by the absence of a sufficient number of enemies, and if these were more numerous doubtless the destruction would be more rapid. That is what I understand is meant. A great deal of local opinion points in that direction—that there are fewer mice enemies about now, but I have never seen any definite statement of the date at which their destruction commenced, or if the circumstances were the same in the case of the plague of 1876, as in the present one. In the outbreaks in the Forest of Dean and the New Forest, there seems not to have been any ground of complaint on this score; probably there was a good deal both of game and of wild birds and vermin.

29. (*Mr. Gillespie.*) It is alleged, I think, that simultaneously with the destruction of the natural enemies of the mice there was an unusual roughness of grass owing to the open season, and it is said that when the mice had better protection from their natural enemies there were also fewer of their natural enemies to attack them. It is the concurrence of two things that helped to produce the great number of mice. It is not simply the scarcity of the owls, but the greater protection afforded to the mice from the roughness of the pasture?

(*Mr. Harting.*) And the greater abundance of food?—Yes; the climatic cause is referred to prominently in the first report of 1580. The winter then was described as much like the winters of 1890–91 in Scotland, and a great deal of cover for the voles existed. That has also been the case in some of the foreign outbreaks.

30. (*Chairman.*) Was it the case that the winter of 1890–91 was like that?—Yes, it was, I believe, comparatively open then in Scotland. That is pointed out in the report which refers to the "unusual mild-"ness of the spring of 1891, and the unusual roughness "of the pasture."

31. The winter of 1890–91 was an extremely severe winter, was it not?—Very severe in England, but not in Scotland, I believe. That is so stated on page 8 of the Report of the Inspectors.

32. I suppose the winter of 1890–91 in Scotland was not so severe as in the south?—I am judging only from the reports put in.

33. (*Chairman to Mr. Elliot.*) You have called the winter of 1890–91 in Scotland a mild winter?

(*Mr. Elliot.*) I do not know that I have called it that.

(*Mr. Gillespie.*) The mice are affected very much by damp with a low temperature. The two things go together—a low temperature, not exactly amounting to freezing.

34. (*Chairman.*) You are going on theory now, and I want to arrive at the ground upon which Major Craigie says in his report that the scarcity of birds of prey in 1890, coupled with the mildness of that season in Scotland, afforded the voles special advantages in the shape of shelter from their natural enemies and favoured their increase?—The words that I rely on as to the suggested climatic cause are on page 8 of the report by Mr. Dudgeon: "A correspondent with, I think, suffi-"cient reason, directs attention to the unusual "roughness of the pasture in the autumn and winter "of 1890, whereby the voles were afforded security "from their enemies, and unwonted facilities for "breeding. The unusual mildness of the spring of

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"1891 must also have been very favourable to the "protection of the voles." Then on page 9, "The "grass, I may mention, in the pasture fields was "unusually abundant during the summers 1889 and "1890, and when eaten bare in 1891 the vermin dis- "appeared. This fact apparently confirms the opinion "I have already alluded to that there is a traceable "connexion between abundant growth of grass and "abnormal increase of voles." Then again, at the end of the report (page 10) he refers to this, and says, "As regards the immediate cause of the present out- "break of the plague, I am inclined to lay considerable "stress upon the fact of the unusual 'roughness' of "pastures in the winter 1890–91, and to the mildness "of the weather at that time, whereby the voles, "always more or less present, gained an extraordinary "advantage in the shape of shelter from their natural "enemies, and in facilities for breeding." Then he adds, "The suddenness of the appearance of the plague "seems undoubtedly to point to some climatic cause, "and the previous outbreak in Roxburgh in 1875 (when, "by the way, the plague was neither so extensive, nor "did it so rapidly increase,) was preceded by somewhat "similar climatic circumstances." In the next report by Mr. Davidson it is remarked: "Voles are stated to "be always present on the hill pastures, but they "began to show signs of increase in 1890, and in the "spring of 1891 are reported to have appeared in "alarming numbers." Mr. Davidson, verbally in an interview I had with him, attributed that large increase in some way to the mildness of those seasons, but I think it would be desirable that the Committee should examine those two inspectors who wrote these reports, because these are only summaries of a large amount of information obtained by them. The same matter occurs in the letters written by the Highland and Agricultural Society, and I would point out also that referring to the outbreak of 1875–76 the paper which the Committee have thought desirable should be put in by Mr. Oliver contains a reference to the absence of black frost as being peculiar. A different kind of frost may not have done the same harm, but there was no great amount of black frost in the preceding winter, and the absence of that particular form of cold apparently contributed to the spread of the voles. I think the Committee might get information also as to the weather conditions of another and different outbreak which took place in the same year, 1875–1876, in Wensleydale, in Yorkshire, and in that part of the North of England. It would be very desirable to ascertain if there are any records in the North of England with reference to the subject similar to those kept by the Teviotdale Farmers' Club.

35. Can you suggest any particular source to which we should apply for information?—I had a name mentioned to me, that of Mr. G. Bolam, of Berwick-on-Tweed, as likely to have some information as regards the natural history of similar outbreaks in the North of England, and we could communicate with him. I have also asked Sir Jacob Wilson, who is Director of the Land Department of the Board, to obtain, if he could, from Northumberland or any district near, any records on the subject; but although I have made several inquiries, I have not found any one with the experience that would be able to assist us in this inquiry as to the Yorkshire attack. Wensleydale was the special site I referred to, and there are also other parts of the West Riding and of the North Riding.

36. Since this report was presented, two months ago, have you had any records from the North?—We have had various reports sent to us from meetings of farmers, but no official reports from our inspectors.

37. No information as to the decrease of the plague?—I have had one or two pieces of information during my own visit last month, and in ordinary letters some indications that a decrease had occurred in certain districts, but others indicated that an increase had taken place, others that the owls were now much more numerous, and others that the plague was spreading towards the north and west and in Kirkcudbright. Another letter stated that the voles were going into the low country and attacking oat crops.

38. How long ago was that?—Between three and four weeks ago. The last information that I had was taken from a local paper—the name was not given, but it was sent by an inspector—pointing out that there was no large increase. A recent letter I had from Mr. Stewart, of Middlegill, whose farm I saw in May last, states that large numbers are still present on the ground that I had walked over—so many that he killed 69 in the course of an hour's walk.

39. In what neighbourhood was that?—It was in Dumfrieshire, above Beattock, and it is mentioned there that as many as 14 young had been found in a single nest, I think.

40. (*Mr. Gillespie.*) Had you special reports from the two inspectors?—No later official reports; we had one or two private letters.

41. But do they corroborate the earlier information?—Yes, entirely. Mr. Dudgeon says that he could add nothing material in the way of new points to the remarks that he had made before, but I have seen both Mr. Dudgeon and Mr. Davidson recently in London, and they have reported verbally that the matter is apparently much in the same position; but we possess no record showing in what direction the mice are actually extending or what changes had occurred in areas affected. My own impression from going over Middlegill farm, and from the evidence of the shepherds and others that I conversed with on the farm, was that there were many fewer voles than there had been one month or even six months before, but that might be because they were moving from ground where they had done damage, to fresh ground. We did not come upon any nests with young voles in them in our walks.

42. (*Chairman.*) You have heard statements as to the disparity in the proportion of the sexes, have you not? Yes; that was brought to my notice, and I saw it obviously amongst the mice that were killed.

43. Was there a great preponderence of males?—There was a great preponderence of males—very few females to be seen, and few females killed.

44. Have you ascertained whether that was the case in previous outbreaks?—I have not heard certainly about it. The shepherds who saw young in the nests noticed that there were fewer females in each litter than males.

45. (*Earl of Minto.*) We killed a lot the day before yesterday (June 8th), and they were all males?—In some cases that I have heard of there were only one or two females in a litter.

46. (*Mr. Harting.*) Might not the reason be this: that the females at that time were underground giving suck to the young?—Yes, that might be so as regards those killed on the surface.

47. The males would be more easily discoverable, because they would be otherwise engaged above ground?—But that would not explain the disparity of sex in each litter.

48. (*Mr. Gillespie.*) Might not the scarcity of females as seen by the shepherds and others and by yourself at the time of your visit be due to the fact, that a considerable number of them were underground that had not been underground early in the season and breeding?—Undoubtedly, it might be so; many of the runs are very near the surface there, but when we lifted large stones and boulders on the hillsides we could see where the runs were, and no mice were in them. I think this due to the fact that the food in the immediate neighbourhood was nearly all cleared out, and they had probably moved to some other quarters where there was more food to be got. In going over the hills we killed in a very short time about 40 voles, and of those 40 only two were females.

49. (*Chairman.*) The complaints have nearly all been from hill districts, have they not?—All the complaints that have been received have been from hill districts. I have not had any letter referring to any extensive damage elsewhere. One arable field had been mentioned as attacked in the parish of Wamphray, in Dumfrieshire.

50. (*Mr. Gillespie.*) There have been several other instances, but comparatively few?—Yes. May I now refer to the foreign part of the inquiry.

51. (*Chairman.*) By all means if you wish.—It was thought desirable by the Board before this Committee was appointed, to make certain inquiries as to the information to be obtained in foreign countries on the same subject, and a letter was addressed to the Foreign Office asking for information in one or two countries where the same or similar plagues had been largely prevalent. The countries from which we have received definite replies are France, Norway, and Sweden. In the case of France my attention had been called about a year ago to a circular issued by the Minister of Agriculture. It was addressed, it appears, to the departmental professors recommending a remedy, and I have here a letter which I propose to put in from the

Minister of Agriculture at Paris, forwarded by the Foreign Office, wherein M. Develle says, "In reply to "the inquiry which your Excellency has been good "enough to address to me as to whether there have "been invasions of field mice in France, which have "damaged the crops by ravages similar to those now "being experienced in the South of Scotland, and as "to whether the French Government are cognisant of "any remedies for dealing with the plague (of mice), "I hasten to inform you, that at different periods there "have been visitations of mice and voles in various "parts of this country, and that in connexion with "this subject I have issued instructions to the pro-"fessors of agriculture recommending a remedy" [there being one professor to each of the 87 depart-ments] "which had been employed with excellent "results in Mayenne. I send you a copy of these "instructions, and I have reason to believe that the "methods therein described might be usefully applied "in this case." That is a pure case of using poison. The circular is very short; shall I read it?

52. Yes, if you please?—I will read the translation, though I have the original document here:—"I am "informed that in numerous districts there has been "a repetition of the damages to crops caused by voles "and mice. The agricultural population is alarmed "by the ravages committed by these rodents, and I "have recently received numerous representations on "this subject. I consider it necessary to draw your "attention to the following method of destruction "which has been employed with success for several "years at the École pratique d'agriculture de "Beauchêne (Mayenne). A mixture of $\frac{4}{5}$ths of flour and "$\frac{1}{5}$th arsenic is introduced by the aid of a small palette "knife into the middle of a drain pipe with an internal "diameter of about three centimetres (about 1¼ inches), "and this pipe is then put near the holes of the mice. "This procedure is simple and inexpensive. Moreover, "by its adoption, domestic animals and game are not "exposed to the danger arising from an absorption of "the mixture. I think therefore that experiments "should be made. I invite you accordingly to visit "the localities in your Department which may be "afflicted by the ravages of the rodents and to make "known to the inhabitants by the medium of lectures "the method of destruction which I have just described "and from which I have reason to believe they may "expect the best results." That refers only to the use of poison; but there are difficulties in the way of using poison in this country (as pointed out to me by various persons in Scotland), partly from the illegality of the laying of poison in certain places; there is uncertainty as to whether placing poison in a drain pipe or in any other than a closed place would or would not be legal. That is a question for a legal opinion; but I was also informed that in Scotland a very similar remedy to the French remedy, had been some time ago successfully employed in the north of Perthshire.

53. As to the legal point, it is perfectly legal to poison rats, is it not?—In an enclosed place.

54. How do you define an enclosed place?—That would be a matter for the court. I do not think there is any definition in the Statute (the Poisoned Grain Prohibition Act, 1863).

55. A shrubbery?—An enclosed plantation with a fence round it. The place in Perthshire where the poison was used was enclosed with a fence.

56. An arable field?—It would be a question of fact probably in each case whether other animals might obtain access.

57. (*Mr. Elliot.*) If you put poison in a drain pipe is that laying down poison in an enclosed place?—That is a point on which there might be a legal opinion obtained. A drain pipe could not be entered by a large animal, but there are other difficulties as that caused by the mice partaking of the poison and afterwards coming out and being consumed by some larger animal.

58. I have heard of one farmer up by Yarrow trying poison in a drain pipe and he thought it had a good effect?—We have not received any official news from the German Government, but from a private firm we have received a communication with this large parcel (*indicating*), which contains strychnined oats I under-stand, and a machine, a special tube and apparatus which is employed largely in certain of the fields of Germany for the purpose of blowing this poison into the holes of the field mice. I have handed over the descriptive papers and the parcel to this Committee, and it is of course at their disposal to see whether it is worth making an experiment with or not. In a letter I received yesterday from Scotland some very similar poison appears to have been used there.

59. The people who have sent that parcel are people interested in the sale of it, are they not?—The company interested in the sale of it, sent it doubtless as a matter of advertisement, and to call attention to their com-pound which they said had been very largely used abroad. I should explain to the Committee that this is not an official report but only sent by a private firm.

60. (*Mr. Harting.*) This (*indicating*) is a sample which I had analysed last night, and I have received the analytical chemist's report this morning. The poison is strychnine, and the pink colour is imparted to it by aniline dye for the purpose of calling marked attention to the grain so that it may not be used by mistake for any other purpose than that for which it is intended.

(*The Witness.*) The best account of the different remedies employed in Germany is to be found in this little volume by Dr. Ableitner of which I have obtained a copy from Germany. Perhaps I might give briefly descriptions of one or two of the methods recorded in it.

61. (*Chairman.*) You refer to some methods of de-struction?—Those that are in vogue in Germany and elsewhere by private persons, not necessarily by officials.

62. Have you any information as to the result of their application?—There are many mentioned in this volume as having been more or less successful.

63. Mentioned by the inventors?—No; not only by the inventors themselves, but by Dr. Ableitner, the author of the pamphlet. My extracts from this pamphlet are as follows: "Most authorities agree "that the only perfect and absolute remedy for a mice "plague lies in natural causes which are beyond the "control of man. Among animals besides cats and "dogs, weasels, hedgehogs, foxes, and badgers, are "mentioned as being useful in the destruction of mice. "The naturalist Lenz considers the weasel as superior "to the others since it is the most bloodthirsty, and "thanks to its slim and supple body can penetrate "easily into the holes and runs of the mice. Of birds, "buzzards, owls, crows, hawks and shrikes are all said "to prey upon mice. In some districts on the "continent attempts have been made to destroy mice "by disturbing their runs with the plough." That is in arable fields, "and killing the vermin with sticks "and shovels. This has been found fairly effective in "limited areas. During the great mice plague in "Hungary in 1873–74, when nearly 75,000 acres were "ravaged by the pest, a special committee reported "to the Hungarian Ministry of Agriculture, that "poison and the other ordinary measures such as pits "and traps were of no avail. They recommended that "the ground should be ploughed in order to disturb "the nests, and force the mice to leave them, when the "vermin could be easily killed with spades and sticks. "This method was adopted all over the infested area "with considerable success. Stopping up the holes "and runs, driving large flocks of sheep over the fields, "rolling the ground with heavy rollers and exercising "cavalry on the land are methods of destruction "which have been tried with good effects on limited "areas. Pit traps have been sufficiently described "elsewhere. Small upright cocks of hay, straw or "long grass distributed over the land are said to "attract large numbers of mice for shelter. A deed "wide ditch is afterwards dug round the cocks, and the "hay or straw set on fire when the mice jump into the "ditch and can be easily killed. Flooding the fields "and meadows is said to be one of the simplest and "most effective methods of destroying field mice. "In the province of Saxony in 1857–59 very satis-"factory results were obtained by digging holes 19 "inches deep into which the mice fell and were "afterwards destroyed. Amongst other physical "remedies are the pungent smoke of smouldering "moss, leaves, &c., and the fumes of burning sulphur "and of other similar substances injected into the "holes and runs by suitable apparatus, which have in "some instances proved very effective in dealing with "visitations of mice. Several appliances for injecting "the smoke and fumes, as described, have been invented "abroad. Professor Nessler of Carlsruhe has recom-"mended a remedy known as smouldering cotton, "which is placed in the holes and runs, and smokes "the mice out. This is made as follows: 100 parts saw-"dust and cotton waste, 20 parts sulphur, mixed in a hot "solution of 100 parts saltpetre and 120 parts water.

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"The whole is then dried and made up into a thick paste "with tar and tragacinth gum, cut into short pieces, "and again dried. If the smoke is seen escaping from "any holes or cracks those should be at once blocked. "The injection of water at high pressure, and of steam, "is also recommended where engines for the purpose "are available."

64. It seems to me to be very piecemeal.—They are all piecemeal, and seem to apply to short outbreaks generally in arable fields, and they are not applicable to hill pastures. Amongst the vegetable poisons that have been used are preparations of hellebore, corncockle, *nux vomica*, *cynoglossum*, the seeds of the acacia, and the heath berry, are all suggested as being more or less destructive to field mice. In an old chronicle farmers are instructed to lay some wheat or barley in the ashes of burnt oak wood until the corn begins to swell. The grains are then to be placed in the holes and runs of the mice. Of mineral substances and poisons, arsenic, phosphorus, gypsum, barium oxide, lime mixed with petroleum, chromate of lead, chloride of lime, and hyperoxide of lead have been used in various forms as poisons for field-mice. Arsenic and phosphorus are dangerous poisons, and their use is only recommended under certain conditions such as are mentioned in the papers already in the hands of the department. Gypsum is not poisonous, and is described as a most effective and valuable remedy. Powdered burnt gypsum is mixed with an equal quantity of dry wheat meal to which some sugar is added, and the whole scented with a little aniseed oil. This preparation is scattered about the runs and holes or placed in earthenware vessels at suitable spots. The mice eat it with avidity. When taken into the stomach it combines with the gastric juices to form a solid indigestible ball of gypsum which causes death. This remedy is said to be absolutely harmless to other animals, and is both simple and effective. Barium has been discussed in another paper. Petroleum and lime are only suitable for use in orchards attacked by mice. Chromate of lead was officially recommended as a poison for field-mice in the fifties. Grain is coated with the poison and scattered near the runs. Chloride of lime has been recommended by Von Marquard, in Bavaria. The inoculation of mice with contagious or infectious diseases (pox, scab, anthrax) has been recommended by several scientists as a remedy for mice plagues. Dr. Joseph has stated in the *Landwirth* of 1882, that thousands of mice die from scab, and he suggests that it would be an easy matter to propagate this disease amongst the vermin by inoculation. In Franconia a curious remedy has been suggested. Farmers are instructed to catch as many live mice as possible, and after smearing them with cart grease and fish oil to let them run free. The odour of the grease is said to be so offensive to the mice that they clear out of the runs and can be killed in scores, while many run themselves to death. This operation is to be repeated until the land is practically clear of the vermin. These are notes made from the German reports. I have received an official communication from Her Majesty's Minister at Stockholm, in answer to a letter sent by the Foreign Office, but the letter only points out that although in some respects the plague of lemmings which are so common in Norway, are similar to the mice plagues here, they are not identical, and cannot be relied on as an analogous case. Professor Collett had been applied to by our Consul-General of Christiania. He says:—"The circumstances "attending the plagues of lemmings in Norway differ "very materially from those connected with the "present mice plague in Scotland." I may say that I have also communicated with Professor Collett, and he was unable to give me any suggestions. He thinks that "some useful information might probably be "obtained in Germany, where such plagues frequently "occur. The attacks of these mice, Mr. Collett states, "usually commence weakly the first year, increase to "an enormous extent in the second, and cease from "natural causes in the third. He is of opinion that "nature has provided a remedy against the attacks of "the lemming by afflicting them with a disease which "decimates their numbers so soon as they increase to "an alarming extent. Something of the same kind, "he thinks, will probably occur among the mice in "Scotland." Among authoritative articles which have been written upon the lemming (*Myodes lemmus*) may be mentioned those by Mr. W. D. Crotch, and by Professor Collett in the Journal of the Linnean Society of London (vol. xiii. Zool. 1878) and one by Mr. T. T. Somerville of Christiania in the Proceedings of the Zoological Society of London, 1891 (pp. 655–658).

As regards the state of matters in Thessaly, Greece; we have had a variety of reports, but the series are not yet complete, and perhaps it would be convenient only to put those before the Committee when I have got the official reply to the last communication I have had sent to Athens. I have the preliminary report here.

65. Does that describe the application of any remedy?—The first report I have describes an outbreak of what were then referred to as rats, but in a subsequent report from Her Majesty's Consul at the Piræus it was explained that they were really mice, or voles of some sort, and it is said that steps were being taken to deal with them. An early step was to use a very inflammable substance of strong odour.

66. By whom were these steps taken?—Taken by the Government, I believe, and partly by private persons; but on those points I have asked for distinct information showing exactly how far the Government and how far the official authorities have information as to the existence and extent of the plague and of the action taken. One of the last reports we have from Greece refers to exaggerations which have appeared in the newspapers on this subject. The authorities state that the attack in Thessaly was never so extensive as originally reported, and that the extermination had been partly effected by the use of ordinary poisons, and partly by the poison introduced by the German Professor Dr. Loeffler. But this it appeared had been aided in its effect, by the heavy rainfall, and I have sent for information as to the share ascribed to the rainfall, and perhaps it would be more convenient not to give more detail as to that till I have it complete, when it can be published in the Appendix if desired [see Appendix IV.].

67. (*Mr. Gillespie.*) Have you any reliable information on which to form an opinion as to whether Professor Loeffler's plan has been successful?—I shall not have this till I have received the detailed reports. The reports given here indicate that Professor Loeffler's plan was not the inoculation of the disease by a germ which would kill mice generally, but by a bacillus which would only kill the particular mouse inoculated, and it took from six to eight days to kill that mouse. I do not wish to attach great importance to that, because we have not had detailed reports from our Minister there, and I think we had better wait to place them before the Committee when they come. I have no doubt Dr. Loeffler's system has been of some benefit, because it is specially mentioned in one of the reports as being one of the causes that got rid of the mice, but the description of it does not lead one to think it is very rapid in its action.

68. (*Mr. Harting.*) May I ask whether amongst the various remedies suggested there are any which in your opinion are worthy of the serious consideration of this Committee?—I have received a great deal of correspondence on the subject of possible remedies, and I thought it better to place in the hands of the Secretary all the letters I have received. The majority of those I think will not be applicable to the conditions of the Scotch outbreak; most of them refer to plans impossible to try in Scotland; and the conversations I had in Edinburgh with various practical men who have tried the different remedies, were certainly not encouraging; none seemed to be satisfactory. The mention in the notes that I hand in now, of poison, was more direct testimony in favour of poison than any we have yet seen. It is not for me to say what in the judgment of the Committee might be worth consideration, but the systems reported do not strike me as so clearly commending themselves, that the Government should publish them to the country as feasible or infallible mice remedies. I think it would require a good deal of investigation before anyone of them could be recommended with any confidence.

69. (*Chairman.*) Does that conclude your information from foreign countries?—Yes, unless the Committee have any special questions to ask me, I have no more evidence in chief to offer than what I have already put before you.

70. (*Mr. Gillespie.*) You cannot tell, can you, whether the animal that infests Thessaly is specifically the same animal as the vole in Scotland?—Whether it bears the same name scientifically?

71. Is it scientifically the same animal?—That is a point on which I have asked for information, and I have not yet got a definite answer. There is a doubt whether it is the same species, but it is a very similar animal.

(*Mr. Harting.*) I have read an article in the French '*Journal d'Agriculture Pratique*' of 19th May 1892, by Dr. Gennadius giving an account of Dr. Loeffler's method, and at the commencement of this it is stated that the animal is a vole of the same genus (*arvicola*) but of another species. It is a European species (*arvicola savii*) not found in the British Islands; but for all practical purposes, in regard to food, habits, and so on, it may be considered identical.

72. (*Mr. Gillespie.*) May I ask if among any of the suggested experiments that have been brought under your notice there are any that would be worthy of experiment by the Committee? Supposing they were tried, is there anything that gives a *primâ facie* appearance of being successful, seeing that we have power to conduct experiments?—There is, no doubt, evidence given in letters that in one instance at least poison has been used with success; but this proposal is surrounded with difficulties, both legal and practical, and I think it would be rather for the Committee, whose practical knowledge on this matter is much greater than my own, to decide whether it would be possible to make useful experiments of that nature or not. There is evidence to show that poison has killed mice, but no evidence for example that the roller suggested by some persons could possibly be employed on any such land as is affected here. In the evidence I propose to put in as to 1814, the use of pit-falls is mentioned in the Forest of Dean, but the ground was of a different nature there. Also the cutting of deep open drains through the hills might be dangerous to sheep.

73. (*Earl of Minto.*) Is there any evidence from the foreign countries referred to, as regards the disappearance of these little animals; that is, their sudden appearance in great numbers and their disappearance again—any cause, I mean, that could be assigned for their disappearance, because, I suppose, they disappeared eventually?—Yes, they disappeared. These animals, so far as I have been able to read their history, have usually appeared in great numbers, and then died out after a certain time, sometimes, however, a number of years; but there is no reason, or no sufficient and definite reason assigned for such disappearance.

74. (*Chairman.*) If we could ascertain why they disappeared, that would be very useful?—Quite so; and that is a point on which I put several questions to correspondents, but I have received no conclusive answers. In the case of Norway the report states that wherever the lemmings became numerous, a specific disease broke out and carried them off, and it is the opinion of some naturalists that either a scab or parasites of some sort in the young animals may appear and carry them off. But neither the appearance nor disappearance of voles is yet entirely or satisfactorily accounted for.

75. Have you any more information to give us?—I have no other information, unless the Committee have any further questions to ask me. If anything further in the hands of the Board is required to be furnished to the Committee at any time, I shall have it in readiness for their use.

Major P. G. Craigie.

10 June 1892.

The witness withdrew.

Adjourned to Monday the 20th instant.

At Howpasley, Roxburghshire.

SECOND DAY.

Monday, 20th June 1892.

PRESENT:

SIR HERBERT MAXWELL, BART., M.P., IN THE CHAIR.

THE EARL OF MINTO.
REV. J. GILLESPIE, M.A.
WALTER ELLIOT, ESQ.
PROFESSOR D'ARCY THOMPSON.

J. E. HARTING, ESQ., *Secretary.*

After the Committee had inspected some of the land infested by voles—MR. WM. M. OLIVER, tenant of Howpasley, called and examined.

Mr. Wm. M. Oliver.

20 June 1892.

76. (*Chairman.*) What is the extent of your farm?—3,000 acres at a rough estimate.

77. How long have you been living here?—My father took the farm in 1858, and we removed to this house in 1859.

78. Of course you are thoroughly acquainted with the ground?—Yes.

79. Did you ever hear of its being affected by a plague of voles such as we have seen to-day?—We had a similar one in 1876.

79a. Was it as extensive in that year?—Not so widely spread, but I think it was very little better as regards the ground that was affected.

80. How long did it last?—I think about two years, beginning in 1875. It may have lasted 18 months, but I have no very distinct recollection. With regard to the actual facts of that plague I can hardly give any real evidence from my own knowledge.

81. When did the voles disappear?—They disappeared suddenly, almost in a night.

82. Did they die?—It was generally supposed by the shepherds and others that they disappeared after a day of rain, another of snow, and another of sleet followed by a severe black frost.

83. After they had disappeared and until last year was the vole a common animal among the hills?—We had always a few, but nothing to create any feeling of alarm. Probably they may have increased previous to the spring of 1890, but not to such an extent as to cause us to take any steps to do away with them.

84. And what has been the effect upon the land, and the stock on the land?—I can only refer you to my letter to Mr. Elliot printed in the pamphlet published by the Board of Agriculture. I think that furnishes as good an answer as I can give to the question. [*See* Appendix I.

85. Do you make any estimate of the proportion of grass destroyed?—It is almost impossible to do so, but I see from the report of Mr. Dudgeon who visited this district that he estimates the destruction at four-fifths.

Mr. Wm. M. Oliver.

20 June 1892.

86. Have the voles spread to the arable land at all?—Yes. I had three acres of lea-corn last year, and they got in below the furrows. They did not attack the sown-out corn so much, but getting in below the furrows, they ran along the furrows and came up and attacked the corn itself. Of the three acres of lea-corn the whole of the stuff was led in five small carts, and the amount of grain that came off it was not so much as the seed.

87. Do you observe any diminution in the numbers as yet?—They are fewer now than they were probably during the winter time. The decrease I attribute to the number of owls that have been flying about, and in the early spring there were also a number of hawks, but the latter have disappeared.

88. What kind of hawk?—The sparrow hawk, I think, though I am not enough of a naturalist to discriminate. I have seen as many as 20 hovering over the plantation of an evening.

89. If they were hovering they would probably be the kestrel?—I do not think they were kestrels, they were not red enough.

90. Have you formed any opinion from your own observation as to the cause of this outbreak; I do not want hearsay?—The only opinion I can form is that expressed in my letter referred to, namely the destruction of weasels and hawks and other so called vermin. The season of 1890 was very mild, and consequently there was a good deal of rough cover for them on the ground.

91. Would that be the season of 1890-91?—The summer of 1890, but I cannot be very positive, I am not stating this from my own observation but merely from hearsay.

92. What became of the hawks you saw?—I do not know. My idea is that they may be gone to hunt where the voles are more numerously seen in the daytime, but others say that they have gone away to breed.

93. Have they not been destroyed?—They have not.

94. The owls still remain with you?—We have more owls now than we had previously, but there are other witnesses who can give more distinct evidence upon this point than I can.

95. What about four-footed vermin, weasels and stoats?—We have scarcely seen a weasel for two or three years past, but they are beginning to increase now, but again upon this point I think some of the shepherds can speak more definitely, because they are constantly on the hills.

96. Have you tried any remedies?—Yes, I have mentioned them in my letter to Mr. Elliot. One of these is digging pits wider at the bottom than at the top.

97. Have you tried any other remedies?—I have tried several, but none of them have been of any use.

98. Have you tried the pits?—Yes.

99. Did you get many mice?—I killed a few, but the statement in my letter referred to gives my opinion in regard to them very distinctly, and I do not think it necessary therefore to repeat it to the committee. [*See* Appendix I.] With regard to traps, I had a very ingenious one similar in principle to the pits, but only about half a dozen mice were killed in it.

100. You would not be sanguine of the result of using such traps upon 3,000 acres?—Well it would be very difficult to put them over that extent of ground.

101. One trap to the acre would not be sufficient?—It would not.

102. Have you tried poison?—No, I do not believe in poison at all. My idea is that in attempting to poison the voles you may poison not only the shepherds dogs, but also the vermin that prey upon the voles. I am distinctly against attempting to poison the voles.

103. Have you tried burning?—Yes, I tried burning a good deal.

104. With what result?—There was a considerable acreage of my farm burned the spring before last, that is in 1891.

105. Was that on account of the voles, or the ordinary moor burning?—It was to do away with the voles. Part of it was bog ground. The consequence was that the mice fled across to Craikhope; but during last winter they came back to Howpasley. On this point again I may refer you to my letter to Mr. Elliot. [*See* Appendix I.]

106. Have the ewes suffered much this year?—Well, we had a slight deficiency in lambs, but I think it would not be wise to state the figures in the hearing of reporters. Here are the deaths for the last five years. The deaths this year have not been so numerous as they were for the previous three years. In the fourth year they were only about one half. The number of lambs in 1887–88 was very much smaller than it is this year. In 1889, 1890, 1891, it was larger. In 1889–90 I consider we had something like an average crop. In 1891 we had considerably below an average crop. In 1892 we had 54 fewer lambs than we had in 1891.

107. That evidence is of no use to us unless we have the figures?—It is not advisable that the figures should go before the public. If the Commissioners would keep them private——

108. The evidence taken by us cannot be regarded as private, because upon the evidence must be founded our report, and to justify our report we publish the evidence?—Well, farmers do not care to have their figures published.

109. We will take the general statement from you that your lambs are under the average?—About two-thirds of the average.

(*Chairman.*) The figures before me hardly bear out that statement.

110. What about wool?—With regard to wool I have no statement this year, but the quantity has been almost the same for the last four years. These questions I consider are of very little value, because we have to consider the climatic conditions of previous years, and the expense at which the sheep have been brought through this year. There is a note of what I have paid for feeding stock this year.

111. How does that compare with former years?—As the amount paid, against nothing.

112. Have you any objection to that amount appearing in the evidence?—I have no objection to that being stated. 144*l.* 4*s.* 10*d.* has been spent on feeding sheep this year, against no expenditure at all during the past five years; except for tups. Of course I feed my tups a little every year, but the expenditure is not applicable to the whole stock.

113. What would the sheep-feed amount to in an ordinary year?—Probably 10*l.* or 12*l.*

114. What recommendations have you to make?—Well, I should say that the protection of the natural enemies of the voles was one of the principal things to be recommended.

115. Are many of these natural enemies of the voles killed here?—Not that I am aware of. I cannot say that I am aware of any number either of weasels or hawks or owls or other vermin being killed.

116. Is there much game on your farm?—Not a great deal. It is mostly black-game. We have a few grouse, but not many. I think a good plan in the higher districts would be to make plantations for the protection and lodgment of so-called vermin—owls, hawks, &c.

117. At present is there very little winged vermin or ground vermin?—Not a great deal; but they are increasing.

118. Since when?—The owls have been increasing for the last two summers, though I am not speaking from my own observation with regard to them. I believe that weasels have also increased on the hills during the present spring.

119. You have told us that some hawks which appeared have disappeared and gone elsewhere?—I do not know where they have gone to, but they are not here now, although they were here during the spring.

120. Would you advocate their protection, because you are aware, are you not, that it implies that other people would have to protect them in order that they may visit your ground?—Certainly; it does not refer to one individual at all, but to the whole community. They would have to be protected all over the country.

121. Is that a subject in your opinion for legislation?—I think there should be a close time at least for hawks and owls.

122. But you do not know what kind of hawks they are?—I think they are the sparrow-hawk; but I should

not like to say. One of my shepherds, who is somewhat of a naturalist, can speak distinctly to the kind of hawk.

123. It would have to be well known what kind of hawk you are dealing with before drawing a bill to provide a close time?—Yes. I believe the kestrel hawk is one of the most deadly, but I have been told that we have none of them. I have not seen any at the present time, [the committee saw five on the wing at once during the drive to Howpasley], but buzzards have come over this season. The shepherds tell me that they have seen several of them.

124. Do they breed near here?—I do not know. In 1876 we had a considerable number of buzzards.

125. (*Lord Minto.*) You say that you think the increase in the number of voles is due to the diminution of the number of birds of prey, weasels, &c.?—Yes.

126. Have you any particular reason for thinking that more of the latter have been destroyed lately than in former years?—We have one way of knowing if they have been destroyed here; but I believe, from hearsay, that a good many were destroyed on Eskdale Muir when Mr. Massey was the Duke's shooting tenant.

127. (*Mr. Harting.*) Do you think that the number of rooks on the moors here has diminished?—No; the landlords have up to this year been trying to diminish them as much as possible; still we have always had a sufficient number.

128. You know there has been an organised destruction of rooks in the lowlands?—Yes; but we have always had a lot up here.

129. You do not think they have diminished in number?—Not perceptibly.

130. Do you think they kill the voles?—Yes, they do. I have seen them trying to catch them, and sometimes eat them as well.

131. (*Lord Minto.*) You say this has been the first time that you have had to pay money for feeding?—Well, I have tried the experiment of feeding previously.

132. But in hard winters have you not had to feed?—There was one winter that I bought a considerable amount of hay.

133. When was that?—We had a ten weeks' storm, and the whole of the farmers round about here had to buy hay. It cost me something like 200*l.* that year for hay; but that was an exceptionally severe winter. I never tried box-feeding before.

134. (*Professor D'Arcy Thompson.*) When had you to begin this artificial feeding?—I cannot exactly say; I am not sure of the date; about Christmas. Some of the shepherds may be able to give you the date more exactly than I can.

135. (*Mr. Elliott.*) What state do you think your sheep would have been in had you not bought feed for them?—There would have been a great deal more sickness than we have at present, and very likely about half the number of lambs. As it is, the lambs are very poor in quality.

136. Are the old sheep in average condition now?—No, they are not. They are beginning to mend, but they are losing a great amount of wool.

137. (*Mr. Gillespie.*) Do I understand that the artificial feeding you employed this year was entirely due to the presence of voles on the hill pastures, and that none of it was caused by severe weather?—It was entirely due to the presence of voles.

138. Do I understand you to say that it is within your observation that there were very few so-called "vermin" on the farms previous to the appearance of the voles?—Yes.

139. Am I right in supposing that the grass for the previous seasons, in 1889-90, was unusually rough. Had you then very grassy seasons?—I think we had, but I cannot say from recollection.

140. (*Chairman.*) It was a very rude, unkindly spring, this, was it not?—Well, we have much more grass to-day than we had last year at the same time.

141. I am talking of the lambing season?—Yes, it was cold.

142. Was the grass very backward?—Yes, until the lambs were pretty well advanced.

143. And the effect of the voles upon the grass would, I suppose, be more marked in a backward season?—Certainly it would.

144. (*Mr. Gillespie.*) Have you not some remarks to make regarding the disparity of the sexes in these mice?—No; I have no statement upon that subject.

William Grieve, Shepherd, Glenkerry, examined.

Mr. W. Grieve.

145. (*Chairman.*) Have you been in Glenkerry long?—I went there in 1861.

146. When did you first observe voles in your ground?—In 1873 or 1874, I cannot exactly say which.

147. Had you been familiar with them before?—Yes.

148. Had you ever seen them in large numbers?—I remember that we used to see them, when I was a boy, in the meadows; and when a nest was found we used to "hap" it because we thought them rare to see. I think the first damage they did was in 1873 or 1874. They began to increase very much then on the hills.

149. Did they disappear suddenly?—Not very suddenly.

150. In 1876?—In 1876 they decreased, and then for several years there were very few, but there were always more than there used to be when I was a boy. Since the first invasion they have been in greater numbers than before.

151. Did they disappear by death, or did they move up to other grounds?—Great numbers of birds came and destroyed them, such as buzzards, which never used to be here before. Owls, hawks, and buzzards, came and picked them up till they thinned them down again.

152. You do not know anything else that would account for their disappearance?—No, sir, I never saw anything to account for it.

153. Do you remember severe frost that year?—Yes, but I do not think it had any effect upon them. They will not drown; they can swim any distance. They swim on the top of the water and never get wet.

154. What became of the hawks, buzzards, and owls you saw at that time?—There have always been hawks, but the buzzards left, and have never been seen since. Since then hawks have been present though not so numerous as then.

155. What kind of hawk do you know?—The yellow hawk.

156. Has it a rounded or a pointed wing?—A rounded wing. We used to call it the yellow hawk.

157. Have you seen many of them this year?—We had a great many; but we have not seen any of them since March. I think the country here is not adapted for their nesting.

158. Then as to weasels, are they not the best mice killers of the lot?—They are exceedingly scarce now. I have not seen a weasel for two years.

159. What is the reason of that?—A great number of them were trapped by the gamekeeper employed by Mr. Massey when he had the shootings.

160. Did that keeper trap many?—Yes, it was said he trapped a deal, but I cannot give the exact number.

161. Did he trap hawks also?—I am not aware that he trapped any hawks. He did not use pole traps at any rate, so far as I have heard.

162. (*Mr. Harting.*) Are there any moles on your ground?—Very few.

163. They do not do any harm to the ground, do they?—No; I believe in having moles on a pastoral farm. They keep the low ground sweet, and do not let it run so much to bog.

164. They give a top dressing, do they not?—Quite so. In the process of clearing land that is overrun with moles a great many weasels would be killed, and that would give the mice a chance.

165. Did you ever hear of a mole killing a vole?—Never.

Mr. W. Grieve.

20 June 1892.

166. What do moles eat?—Principally insects, worms, &c.

167. (*Mr. Gillespie.*) You said you had not seen a weasel for two years; were you in the habit of seeing weasels frequently before?—Yes.

168. So that you have seen a marked change in that respect?—A very great change. I saw a weasel's track in the snow once, though I did not see the weasel itself. I am speaking of the small weasel. I have seen weasels carrying mice in their mouths.

169. You speak of there having been a considerable number of mice since the attack of 1875-76. Do you say there have been more mice since then than previously?—Yes, between that visitation and the present.

170. I hold in my hand a copy of a paper called "Sheep and Wool," in which you state in a letter "The "bog pastures of this district are statedly destroyed by "field mice." I understand from that that they existed in considerable numbers so long ago as four years?—Yes, they did.

171. During the last four or five years has the land had a heavier crop of grass than average?—Yes. The year before last it bore a heavier crop of grass than the average.

172. Do you think that the fact of there being a heavier crop of grass would afford protection to the voles?—Yes, I believe it would have that tendency. In the two years preceding that we had long and deep snows, and I think that also had a tendency to protect the voles and to increase their number.

173. Since 1888, when you had a considerable visitation of them, has there been a steady increase in the number of voles?—Yes; but they rather fell off three years ago, then they appeared in greater force last year.

174. In recent winters has there been very much black frost?—Yes, very much. A 12 months past it was exceedingly hard, and there was very little snow.

175. Did that not kill the voles?—No.

176. (*Mr. Elliot.*) Have you an average of lambs as compared with the time before these voles came?—No, we have not an average crop.

177. Did you require to feed your sheep this year?—Yes, the sheep had to be helped.

178. What would be the cost of that feeding?—Well, the sheep we had on hay cost 4*d.* a head per week, and those we had at home we fed on locust beans and Indian meal at much the same expense.

179. Were your sheep at the beginning of the lambing time in the same condition as they would have been had you had your usual grass in the absence of the voles?—No, they were leaner.

180. Suppose they had been sold at the May term, how much loss would they have occasioned per head on account of the voles being on the land?—I could scarcely say.

181. And your lambs?—On account of being fed the lambs were looking as well as (and may be better than) some on the lower farms, where the sheep had gone through the season without any help, so that if they had been valued they might have made equally as much as if they had been brought through on their natural keep.

182. (*Professor D'Arcy Thompson.*) Do you notice the owls breeding very abundantly?—No, we have very few owls.

183. Professor Newton states in his edition of Yarrell's "British Birds" that in some of these exceptional years owls became very prolific, and that in some nests there were as many as seven eggs. Did you notice anything of the kind here?—No. [*See Qs.* 215, 473, 1031, 1572.]

184. Have you noticed anything as to the proportion of the sexes of the voles?—I think the sexes are quite balanced. There is very little difference.

185. Have you a large number of rooks on your farm?—Yes. A good many are coming now.

186. You do not think they have diminished of late years?—Not very much.

187. You know that elsewhere they have been very much killed down?—Yes, but I think about the same number are coming to us as usual. They come here in search of a grub that is found in the bog.

188. They destroy voles too?—Yes. They dig out the nests. The voles, however, have fewer nests now on the top. They are forming them below the surface now.

189. Do the voles breed right through the spring?—They begin to breed really in March. They do not breed in winter at all.

190. (*Chairman.*) Where is Glenkerry situated?—In Selkirkshire.

191. Have you any suggestions to make as to the means to be adopted to keep down the voles?—Well, no; I cannot say. Everybody is at sea about it. I would suggest that their mutual enemies should be protected. I think that if these enemies came in force they would, may be, get the best of it again.

Mr. D. Glendenning.

DAVID GLENDENNING, Shepherd, Coom, examined.

192. (*Chairman.*) How far is Coom from here?—Two miles.

193. How long have you been there?—Eight years.

194. Have you made any observations on the destruction of owls, hawks, and weasels, or other "vermin"?—Well, I have made the observation that they were destroyed there for a number of years back, though not of late years. Hawks and weasels have been destroyed, but not the owls.

195. What kind of hawk?—The kestrel and sparrow hawk, though we have also the brown hawk, the kite, and the merlin. The first mentioned resembles the kestrel very much, but is rounder in the point of the wing, and of a darker brown than the kestrel.

196. Are hawks still destroyed?—Not at present.

197. Are these keepers on your ground?—Well, the keepers visit the ground in this district.

198. Is there much game about Coom?—Yes, a great deal of game, especially pheasants; they breed very fast.

199. Have you seen the buzzard up your way?—Yes. The first I saw was in the beginning of the first week in May.

200. Have you seen any weasels breeding?—Yes; I know of three litters at present; one a stoat, and two of the small brown weasels.

201. What do the keepers say to that?—The keepers are not meddling with them at all.

202. That is on account of the mice?—Yes. If it were not for the mice they would be all killed, for they are great destroyers of pheasants' eggs.

203. Have you noticed hooded crows?—That will be what we call "the corbie."

204. Are there many of them?—There are very few crows at the present time. It is very seldom I see one.

205. You have noticed a strange kind of crow occasionally?—Yes.

206. How would you describe it?—It is very much the same as the "corn crow," but feathered down to the bill like the corbie.

207. The "corn crow" is what we call the rook?—Yes.

208. Is there any increase in the number of owls?—Yes; since three years past. In the spring they began to breed with us.

209. Are they all of one kind?—Yes; I see no difference.

210. They feed chiefly on the mice?—Entirely on the mice. I never knew them to feed on anything but mice.

211. Has there been a heavy death-rate among the stock?—Yes, with me.

212. Owing to what?—Owing to the poor condition of the stock, which I attribute to the destruction of grass.

213. Have you a fair crop of lambs?—It is a very light crop with me.

214. (*Professor D'Arcy Thompson.*) Are the owls increasing fast?—Yes.

215. How many eggs does each owl lay?—From 9 to 13. There were five pairs with me in the spring, and they have reared about 50 young ones. Some had as many as 13, and some had as few as eight eggs. We have now two sitting for the second time. [*See Qs.* 183, 473, 1031, 1572.]

216. (*Mr. Elliot.*) Are weasels increasing in number?—This is the first year I have seen them increasing. I had two litters last year, and found them lying on the hill dead. I think that was caused by over-feeding on the blood of the voles, because they had inflammation, and were very much swollen.

217. (*Mr. Gillespie.*) When did you first notice a positive increase in the number of voles?—In the back end of 1890 I noticed them greater in number, but it was not until 1891 that they became a plague.

218. How long is it since you noticed a difference in the destruction of vermin?—They have been gradually destroyed for some years back. I have noticed them getting fewer until this last year.

219. How long is it since they were being spared, or getting more plentiful?—About a twelvemonth since they began to protect them, and they have increased a great deal in number.

220. (*Chairman.*) You have devoted some attention to this?—Yes; I have studied and watched them nearly all my life.

221. Do you attribute the death of the young weasels to over eating voles?—I think so.

222. Have you ever seen a weasel kill a vole?—Yes. About three weeks ago I came upon a small brown weasel which had killed five in one of the sheep drains. I followed it up and found it killing its sixth. A week past, on Sunday morning, I came down a drain for 250 yards or so. A weasel had been before me, and there were 22 dead voles in the bottom. I secured a specimen last night in order to show you the way a weasel destroys a vole. The blood is entirely drawn from behind the left ear. There is not a bit of the vole marked otherwise, except by the tooth marks on the head. All those I have seen were killed in the same way. (*The witness exhibited one which had been killed as described.*)

223. (*Chairman, pointing to eggs of the blowfly on the specimen.*) Is that some kind of lice upon it?—I have noticed that.

224. Do the stoat and the weasel eat the flesh of the voles they kill?—I once saw a stoat eat a vole entirely, leaving nothing but the inside. In a general way they only suck the blood. They have to be very hungry before they meddle with the flesh.

225. (*Mr. Harting.*) I understand you to say that you have observed three different kinds of crow here, the "corn crow" (or rook), the hooded crow, and another crow that is like the rook?—Yes.

226. But instead of having a bare face like the rook, it is feathered down to the bill?—Yes; that is the black crow. It is here now; but the grey hooded one comes in November and leaves in the spring.

227. Have you any reason to believe that all three of these crows feed upon voles?—Well, I cannot say that. I have only seen the rook or "corn-crow" feed upon them. I am perfectly sure they do, for I have seen them.

228. Have you heard that in Northumberland the farmers have considered it desirable to kill off the rooks in great numbers, in consequence of alleged damage done to crops?—Yes; I have heard that.

229. Do you consider that a mistake?—Yes. The greatest mistake they could make, in my opinion. I would protect the "corn-crow" for killing the voles.

230. Do you consider they would be justified in killing the Carrion crow?—Yes, I do; because I do not think that this bird is of much use in destroying voles.

231. You think that the game tenants and their keepers might shoot and trap the Carrion crow, but not the rook?—Yes; because the Carrion crow mostly feeds on dead flesh. On that account it is not so destructive to voles; but when it cannot get anything else, I have no doubt it will kill and eat them.

232. (*Chairman.*) It has been stated that moles kill voles. Have you ever seen anything of that?—I cannot pass any remarks upon that, for when the voles came before to this part of the country I was at Liddlesdale Head, and the moles were uncommonly plentiful. But whether the moles made any difference to them or not I cannot say. The buzzard hawks came and the voles very soon disappeared. A great many people besides myself attributed their disappearance to the buzzards.

233. Have you seen a buzzard strike a vole?—Yes. If you watch them you will see it. The buzzard is very heavy and slow generally, but he is very active when on the hunt, especially when about to catch anything.

234. How do the keepers like buzzards?—I cannot say. I do not think he is a destructive bird to game.

235. You never saw herons up here?—Yes.

236. Did you ever see them catch voles?—No, I cannot say I have.

237. Have you any suggestions to make as to the remedy for the plague?—The only suggestion I have to make is to let the natural enemies of the vole increase as much as possible, and to try to form shelters in these parts so that the birds of prey may be induced to live with us through the winter—*i.e.*, cairns for the weasels and plantations for the owls and hawks. The owl (species not named) leaves us now at the end of October, though a few wintered with us last year.

WALTER ROBSON, Shepherd, Craigshiels, examined.

238. (*Chairman.*) Have you been at Craigshiels long?—No, I went there at Whitsuntide.

239. Where were you before?—At Langshaw Burn.

240. Do you speak about the increase of voles here or where you were before?—Where I was before.

241. What have you observed?—About two years ago when I was at Wolfcleuch Head they were very bad upon it. There were no vermin there. An Englishman had the shooting, and his keeper killed all the vermin he could. He killed all there was there.

242. What kind of vermin?—Weasels and hawks. There were no owls at that time.

243. Have you any wood there?—No.

244. Of course owls would only be where woods are?—Yes; but there are plenty there now.

245. Where do they roost?—In bushes here and there.

246. In the glens?—Yes.

247. You say the keeper killed all the vermin. Did you see him kill them?—Yes; I have seen him kill weasels.

248. Has that been going on lately?—It is two years since I was herding there. I was only 12 months at Langshaw Burn.

249. Did you notice a diminution in the vermin at Wolfcleuch Head?—Yes; they were stamped out, not one was to be seen.

250. Then the voles came?—Yes.

251. And you think that was the result of killing the vermin?—Yes. I think it was for want of them that the voles got so numerous.

252. Did your stock suffer much this year?—Yes, and they will suffer still more if this continues, for there will be no feed for them.

253. What condition are the sheep in now?—Oh, they are well enough just now, so long as it keeps the summer months; but if the mice remain the sheep will have to go off the ground, or we shall have to buy hay for them.

254. Have you any remedy to suggest except to allow the vermin to increase?—No.

255. I suppose poison would not do?—I do not think it would.

Mr. W. Robson.

20 June 1892.

256. (*Mr. Gillespie.*) Did you say the vermin was killed at Langshaw Burn?—No, it was at Wolfcleuch Head.

257. (*Mr. Elliot.*) In what year were you at Langshaw Burn?—Last year.

258. What farm is Craigshiels on?—It belongs to Mr. Moffat.

259. Are your sheep in good condition now?—They are fairly middling; but a lot of them will not clip.

260. Were they fed during the winter?—Yes, on hay, which was bought.

261. Were they much expense?—I cannot say.

262. (*Lord Minto.*) Had the shooting tenant at Langshaw Burn the Wolfcleuch head shootings also?—Yes; he had a great deal of Eskdale Muir.

263. Do you know the number of weasels killed there?—No, I cannot say.

264. Was the tenant Mr. Massey?—Yes.

265. Has he the shooting still?—No, he has not got that shooting now.

Mr. J. Inglis

JOHN INGLIS, Shepherd, Ropelaw Shiel, examined.

266. (*Chairman.*) How long have you been at Ropelaw Shiel?—15 years.

267. How far is Ropelaw Shiel from here?—About three miles to the north of Howpasley.

268. What is your experience of this plague? When did it begin?—In the month of March 1891.

269. Is your land much infested now?—Yes, very much.

270. Is the stock suffering in consequence?—Yes, the stock is suffering very sorely.

271. Do you remember any former outbreak?—No, there was no other outbreak during the time I have been there.

272. Were you there in 1876-77?—No, I was at Skelfhill, south from here. There was nothing in that part then.

273. To what do you attribute it now?—We think it is on account of the weasels being so very sorely killed by the game-tenant's keepers. That has allowed the voles to breed to such an extent.

274. Had you any great number of weasels on your ground?—We had a large number.

275. Where did they breed?—On the hills. There was a large number of weasels up till that time.

276. Upon what kind of ground did they breed?—Upon the heather.

277. Have you ever seen a weasel's nest?—I cannot say that I have paid particular attention to it.

278. Then, when you say that they breed among the heather, you mean to say that you suppose they do so?—Yes.

279. Have you any stone dykes and cairns—would they not rather breed there?—Yes; they would breed in such places.

280. As to winged vermin; have you many of them? Not a great many.

281. The keepers have killed most the weasels?—Yes.

282. But they have not killed most the hawks?—No, they have not been so sore on them.

283. Have you any owls?—They seem to be more plentiful since the mice came.

284. You have been able to do nothing to reduce the plague?—We have tried to kill them with sticks and dogs, but have not made them much fewer. Over a great extent of country it is difficult, almost impossible, to make any impression on them, and it is no use unless everyone attempts a general kill, because they move from one place to another.

285. Will there be any loss to the tenants?—There is very great loss to the tenants. They have been paying for feed for the sheep.

286. (*Lord Minto.*) Where is the farm you belong to?—It is in the county of Selkirk.

287. The game tenant was Mr. Massey?—Yes.

288. Is Mr. Massey tenant now?—No.

289. How long is it since he had it?—A year past.

290. The keepers you allude to were his keepers?—Yes. They were not the Duke's keepers.

291. How many had he?—He had four keepers on the ground when he was shooting round about there.

292. Have you any idea of the number of weasels he killed?—I cannot say anything about the number, but we had a great many weasels at the time, and they were well killed. The keepers appeared to be well up to their business. Not one single weasel was left, I can say that.

293. (*Mr. Elliot.*) Did you use much feeding stuff?—Yes, a great deal of hay and corn. It was very difficult to get it out to the sheep, the road was so bad. But for this feeding we would have had great loss. We have had great loss even with feeding.

294. In what condition are the sheep?—They are very thin, and in fact they will never pick up as long as they are on the same ground.

295. Is the grass on your land generally rougher than formerly?—Well, for some seasons we have not had the same growth. I have seen the ground far rougher.

296. When did you notice the increase of the voles?—In the month of March they came to Ropelaw Shiel. They appeared to come from Langshaw Burn or Dalgleish.

297. (*Chairman.*) Have you formed any estimate as to the amount of loss sustained by the tenant in consequence of the voles?—Well I gave one of the gentlemen (the inspector) the averages of the stock.

298. Do you average the death rate last year at 11½ per cent.?—Yes.

299. And the average death rate for the previous five years at 6¼ per cent.?—Yes.

300. Was the crop of lambs this year up to the average?—Scarcely. They were very bad in quality.

301. You state the average of the crop for the last five years at 60, and this year at 48?—Yes.

302. That represents your estimate?—Yes.

Mr. J. Borthwick.

JOHN BORTHWICK, Shepherd, Hislop, examined.

303. (*Chairman.*) Have you been long at Hislop?—16 years.

304. You have taken notice of this plague of voles?—Yes.

305. And I suppose you know generally the kind of evidence given before us?—Yes; I saw the list of questions that were to be answered.

306. You attribute the outbreak to the same cause that other witnesses have spoken to, namely, decrease of hawks and weasels?—Yes; the owls are on the increase.

307. Used there to be more weasels and hawks?—There might be more weasels than hawks, but they have disappeared.

308. Has anyone trapped or destroyed them?—No.

309. What is the extent of your ground?—1,400 acres.

310. Who is on the other side of the march?—The Duke of Buccleuch.

311. Was the shooting let to Mr. Massey?—No.

312. Where is Hislop?—About three miles south from here.

313. The weasels have become fewer, and you do not know why?—I do not know. We never had many hawks.

314. Why do you attribute the increase of the voles to the decrease of the hawks?—Well, I do not know.

315. Is it just what you hear other people say?—I cannot say what is the reason.

316. You have told us that you account for the increase of the voles by the decrease of their natural enemies, but according to your evidence there never were many natural enemies on the land?—There were weasels, but I never saw many hawks.

317. Did you observe the rooks?—Yes; there were a few, but not many.

318. And they are fewer than they used to be?—Yes.

319. Did you ever see them taking voles?—Yes, I have.

320. Has your stock suffered much?—Yes, there has been loss this year. *Mr. J. Borthwick.*

321. To what extent?—Well, I would say about 20 per cent. 20 June 1892.

322. Was there a full crop of lambs?—No.

323. Do you attribute that to the voles entirely?—Yes.

324. Would the backward spring have no effect?—Not much this year.

325. Do you regard it as a favourable season?—Yes, except for the voles, I think the winter was pretty good.

326. Have you any remedy to suggest?—No; I do not know anything in particular. We have tried nothing but killing with dogs.

WILLIAM BEATTIE, Shepherd, Meadshaw, examined. *Mr. W. Beattie.*

327. (*Chairman*). Have you been at Meadshaw long?—Yes, for 19 years.

328. Is this the first outbreak of voles you remember?—No, this is the second.

329. Does your memory carry you back to 1876?—Yes.

330. I suppose the features of this outbreak are very much the same as that of 1876?—Very much the same.

331. Did the animals suddenly increase?—Yes.

332. What was the cause of their leaving in 1876?—I can hardly say; that part of the ground under my charge was only slightly affected, there were far more in this district. I stopped 2½ miles down the water, which was the border of the plague in 1876.

333. And this year?—It is reaching where I stop this time fast.

334. To what do you attribute it?—I could not say unless it is the want of their natural enemies.

335. Are there fewer of these than there used to be?—Not in the meantime, but there were fewer about a twelvemonth ago.

336. There are plenty of owls now?—Yes, and there were a good many hawks about the month of March, but it is generally supposed that they are away breeding at this time.

337. Do you know what kind of hawks these were?—No; I cannot say.

338. Do the rooks take any heed of the voles?—Yes, they kill a good many.

339. Have you seen them kill voles?—Often.

340. Are there plenty of them for the job?—Yes, there are a great number of rooks.

341. Have you paid any attention to the proportion of the sexes among the voles?—Yes.

342. What do you observe?—At certain times of the year more males were seen than at other times, but now there are as many females as males.

343. Have you taken any steps to destroy them?—Yes, I have killed thousands.

344. And thousands remain?—Oh, yes.

345. Have you any other remedy than the preservation of their natural enemies to suggest?—There is nothing so good as the mode of killing described.

346. (*Lord Minto.*) You say that you have killed a great many; how do you kill them?—With dogs and sticks.

347. Do you think if an organised killing was arranged at the same time on the different farms that it would produce any appreciable effect?—Yes; there has been no organised attempt at killing. I do not mean to say that it would clear them out, but it would reduce their numbers to such an extent that they could be kept down by their natural enemies.

348. Is the shooting on your farm let?—I cannot say. It has been.

349. Are there keepers on it?—Yes; a keeper has been resident on it, looking after the farm. It belongs to the Duke of Buccleuch.

(*Mr. Elliot.*) Craig is the name of the farmer.

350. (*Mr. Gillespie.*) Previous to 12 months ago, did the number of natural enemies get fewer?—There were fewer weasels.

ROBERT ANDERSON, Farmer, Eilrig, examined. *Mr. R. Anderson.*

351. (*Chairman.*) How long have you been at Eilrig?—I have been four years last Whit Sunday.

352. Where were you before that?—At West Buccleuch farm.

353. What have you observed in relation to this plague?—We have heard a great many witnesses on the general features of the plague, the way in which it began, and how it has overrun the country; if you have any particular observations of your own to make we shall be glad to hear them?—I have no particular observations.

354. You have seen house-rats killing them?—Yes.

355. Well, that is interesting if you would tell us about it?—Well, I stalked a rat some time ago to its nest, and there were a good deal of dead mice about it.

356. Are you prepared to advocate a close time for the house rat?—No.

357. Have you observed any other animals taking them?—Crows, owls, hawks, and weasels, but weasels are very scarce.

358. Since when?—A good few years back.

359. (*Mr. Harting.*) The big one (or stoat) or the smaller one?—Both kinds, I think. It is seldom one sees a weasel now.

360. Are there any foxes on the hills?—Yes.

361. Have you ever seen a fox catch mice?—Yes, once. At least, I considered it was so engaged.

362. (*Lord Minto.*) Do you know if there are any badgers on the hill?—There is not that I ever saw.

363. (*Mr. Elliot.*) Did you use much feeding for your stock in the spring?—Yes, a good deal.

364. Were you in the habit of feeding stock before the moles came?—No, except there was a storm.

365. Was it hay?—Yes.

366. What state are they in now? Are they up to the usual condition?—No.

367. What is the proportion of lambs?—There is a deficiency of lambs and the quality is bad.

368. (*Mr. Gillespie.*) Were you at West Buccleuch, in Selkirk, tenanted by James Grieve?—Yes.

Mr. R. Anderson.

20 June 1892.

369. Had you any observation there about killing the weasels?—I have seen them killed.

370. Was there a fair supply of weasels on the place when you were there?—Yes, there was.

371. (*Mr. Harting.*) Have you ever heard it stated that moles kill field mice?—Well, I have heard so, but I cannot prove it.

372. You have no evidence on that point?—No.

Mr. J. Anderson.

JAMES ANDERSON, Farmer, Craikhope, examined.

373. (*Chairman.*) Your land has been very much affected by the voles?—Yes, very bad.

374. I suppose it is as bad as any around?—Well, I think it is as bad, if not worse, than any.

375. Did stock suffer much in consequence?—Well, if we had not taken care and box fed, the stock could not have lived on the ground.

376. Is that general every year?—Oh, no, this is the first time.

377. How long have you been here?—Fifteen years last Friday.

378. What was the cause of the box feeding?—We had no hay on our own ground from last year, and we had to start to buy hay and had to begin with box feeding too.

379. What was the reason of the bad hay crop?—I blame nothing but the mice. There used always to be plenty of hay till the mice came.

380. That would be a serious matter?—There is no mistake about that.

381. Have you a good crop of lambs?—No, and if we had not fed we would have had very few, if any.

382. (*Mr. Elliot.*) Have you any moles on your land?—There is no such thing as a mole on my ground, but I have often thought moles would have done good to the land.

383. Have there been no moles on it since you went there?—Well, there might be a few, but at this time I think I can say that there is not a mole upon Craikhope. This is the second time I have had the voles. I do not think they were so bad last year as this. If I had not hayed the land very much last year there would have been a very great loss. Last year we had no hay, and it was all to buy.

384. Did you box-feed many of the sheep?—Most of them, except 200, or thereabouts.

385. (*Lord Minto.*) Was not a good deal of your ground burned?—It was so bare this last year that I could not burn it. I burned what I could. It was so much eaten down that only small pieces would burn.

386. Have you killed many of the mice?—Well, I killed all I could. I did what I could with dogs to keep them down. I never saw so many mice in my life. I could not have believed that they could have spread over so much land.

387. (*Mr. Harting.*) Several of the witnesses have referred to the season of 1891; do you remember the season of 1890?—That was the year they started first with me. It was in the spring. Six years before that I had a turn of them.

388. What sort of a season was 1890, do you remember?—It was a wet season when they commenced.

389. Do you attach any importance to that?—All I can say is that there was a great deal of roughness on the land.

390. Do you think the wet season had any effect?—I think it helped them to increase as they did.

391. You think that to a certain extent that affected the present outbreak?—Yes, I think that was what increased them so much.

392. Did the rough land afford greater shelter to the mice and provide them with greater abundance of food?—Yes.

393. You say that that was one of the causes of the present outbreak?—Yes.

394. What other causes do you assign? Do you say that anything is due to the destruction of their natural enemies from your own observation?—Yes; weasels, owls, and hawks.

395. Do you think that if these were more numerous there would be fewer mice?—Yes, I think they would help to thin them and keep them in check. Crows destroy a great number of mice. There are a few weasels, but I think more owls than any other so called "vermin."

396. From what you have observed have you any reason to suppose that these so called vermin have been killed off more frequently of recent years than before?—I do not think they have been killed of late.

Mr. W. Rae.

WILLIAM RAE, Shepherd, Rushiegreen, examined.

397. (*Chairman.*) What is the extent of the farm?—I do not know the extent exactly.

398. Can you tell me the number of sheep upon it?—Between 1,400 and 1,500.

399. Has there been any loss on them this year?—Yes, there has been a heavier loss on them this year than last.

400. Can you estimate the loss?—It will be about seven per cent. more than the average.

401. Is that owing to deaths?—Yes.

402. Did you have to feed?—Yes, we fed a great deal.

403. What would that cost you?—Well, I cannot say, as I had not the bills to pay.

404. Was that the first time you ever had to feed?—Yes.

405. To what was that owing?—Entirely to what the voles destroyed.

406. Is your ground badly run with them?—Yes, it is uncommonly bad.

407. Are there any signs that they are disappearing?—They are thinner than they were, a good many of them have been destroyed by owls and weasels.

408. You have plenty of weasels?—A few.

409. And they have been pretty busy?—To all appearance.

410. (*Mr. Gillespie.*) In speaking of seven per cent. above the average, that is simply death-rate?—Yes.

411. Are the lambs as good in quality at this season as usual?—Oh, no, they are very bad.

412. What kind of feeding did you use?—Hay, cotton cake, and Indian corn.

413. A heavy outlay?—Yes.

414. (*Professor D'Arcy Thompson.*) In what month did you require to begin feeding?—On the 6th of January.

415. (*Chairman.*) Is your lamb crop up to the average?—No, it is 344 below the average.

416. And you account for that entirely by the poverty of the ewes?—Entirely for the want of grass.

Adjourned to Tuesday the 21st instant at Hawick.

At Hawick, Roxburghshire.

THIRD DAY.

Tuesday, 21st June 1892.

PRESENT:

SIR HERBERT MAXWELL, BART., M.P., IN THE CHAIR.

THE EARL OF MINTO.
REV. J. GILLESPIE, M.A.
WALTER ELLIOT, ESQ.
PROFESSOR D'ARCY THOMPSON.
J. E. HARTING, ESQ., *Secretary.*

WILLIAM M. OLIVER, Howpasley, recalled.

Mr. Wm. M. Oliver.
21 June 1892.

417. (*Mr. Carruthers.*) In reference to your statement yesterday as to the lambs being two-thirds of an average crop, am I right in understanding that the average crop is not confined to the five years?—No; it is the average crop on the farm for a considerable number of years.

418. Am I also right in understanding you to mean that during the last five years the actual average has been less than the average crop?—During the five years it has been rather less than the average crop.

JOHN SCOTT, Newton, Hawick, examined.

Mr. J. Scott.

419. (*Chairman.*) Are you tenant of Langshawburn?—Yes.

420. How long have you occupied the farm?—Five years.

421. What is the extent of Langshawburn?—4,260 acres.

422. Has your ground suffered much from this invasion?—Very severely.

423. When did it begin?—It has been there since ever I took the farm five years ago.

424. Have they increased lately?—They increased in the autumn of 1890.

425. You say they have been there, but have they been there to a considerable extent?—Yes, to a great extent.

426. Did you notice them before taking the farm?—No. I saw them the first season after the snow left.

427. Did you take any means to destroy them?—We took means in the autumn of 1890 to kill them.

428. What means?—I hired a man with 12 terriers to kill them.

429. Had that any appreciable effect?—We killed a great many of them. We killed from 400 to 600 a day.

430. They still remain there?—Yes, but there is not one for every hundred we had before.

431. Do you attribute that to the means used?—No, I think they ate themselves out and went away.

432. Did you try any other means?—We got 100 cats and turned them loose among the mice.

433. Who is the tenant of the game?—It is not let at present.

434. Is it a farm of the Duke of Buccleuch's?—Yes.

435. I suppose the gamekeepers do not approve of the cats?—We had one keeper helping us along with the man and the terriers. He did not say anything against them.

436. Have you observed any increase in birds of prey, such as hawks and owls?—There is a very great increase of them since the mice came.

437. What kind of hawks?—I could not say.

438. I suppose you do not interfere with them?—No.

439. Have you made any estimate of the damage done?—I know what it cost us for extra feeding. We had 842 sheep off the ground nearly all the winter, which is very much above the usual.

440. Had you to feed the ewes in spring?—We gave them hay, but we had the hay on the farm, and had only to buy two tons.

441. (*Earl of Minto.*) Do you attribute the increase of the voles to any particular cause?—I cannot say what is the cause of the increase.

442. Do you think that the vermin has been more killed down than before?—Not to my knowledge.

443. Is your farm in Eskdalemuir?—Yes, Mr. Massey had the shootings.

444. While he was there do you think the vermin were more killed down than before?—Not that I know of.

445. You say you have killed a great many of these voles; has there been any general organisation for the purpose of killing them?—Not that I know of.

446. Would it not have been possible to do a great deal more with organisation?—No doubt; if we had started in the autumn of 1890 we could have killed a great many more.

447. Now you think all the vermin are increasing?—Yes, weasels, too.

448. You do not know what head of vermin Mr. Massey's keepers killed?—No, there is no record of it.

449. (*Professor D'Arcy Thompson.*) Was Mr. Massey shooting tenant during your occupancy of the farm?—Yes, I think so.

450. (*Mr. Gillespie.*) You say that the vermin were not killed down more than formerly; as far as you know were there many vermin on the place since you occupied it?—Not many.

451. (*Mr. Harting.*) Have you many rooks on your farm?—Yes, there are a great many "corn-crows" as we call them, or rooks.

452. Have you observed that these rooks kill the voles?—I have not seen them kill the old mice, but I have seen them scrape out the nests and kill the young ones. I think the rooks should be protected, as they do good by helping us to get rid of the voles.

453. Can you say the same for carrion crows or hooded crows?—One does not pay much attention to them.

454. Is there any rookery near you?—There is no rookery nearer than Craik, which is six miles off.

455. (*Chairman.*) Have you any suggestions to offer with a view of extirpating the voles?—I think if there was a general killing with dogs a great many of them could be destroyed.

Mr. J. Scott.

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456. Have you any belief in poison or traps?—These have never been tried with us. The mice are very much down with us. The plague seems now past so far as we are concerned.

457. If you had learned of their existence or the probability of there being such a number of voles, would you have taken your farm five years ago?—Certainly not.

Mr. J. Hobkirk.

JAMES HOBKIRK, Broadhaugh, examined.

458. (*Chairman.*) You have been tenant for many years?—For 25 years at Whitsuntide past, and I am tenant of the farm of Eilrig as well. They are separate farms with entry at the same time.

459. What is the extent of both farms?—Broadhaugh is 750 acres, and I have never known the extent of Eilrig, but take it to be about 1,100 acres.

460. You are also chairman of the Teviotdale Farmers' Club?—Yes, I have been chairman for two years or so.

461. Do you remember in 1875 or 1876 a similar prevalence of voles?—I have a very distinct recollection of it.

462. You undertook an inquiry?—Yes; I was at the time only a member of the Teviotdale Farmers' Club and not chairman, but I was appointed one of a deputation to go up to Borthwick and inquire into the state of affairs. I think there are only two of the deputation now surviving.

463. Was the outbreak at the time very extensive?—Not very extensive, but entirely of the same nature and character as the present outbreak.

464. Occupying the same area?—Not nearly the same area. On Eilrig there were comparatively few to what there are just now. They were confined wholly to the rough damp marshy bog land, but what they did attack was entirely destroyed.

465. They were on the ground we visited yesterday, were they not?—Yes, very bad.

466. What became of them?—It is impossible to tell. Their disappearance seemed to many of us very mysterious, but there is no doubt that there was an immense increase of buzzards and owls roosting in the plantations. I remember that the late Mr. Moffat, of Craik, and I went into the plantations and picked up heaps of pellets there which consisted of the fur of voles almost exclusively, showing the numbers of those destroyed by the birds which were roosting in the plantations.

467. Were these the pellets or castings of buzzards or of owls?—Perhaps both. There were visibly castings of owls, but there were large accumulations that hardly partook of that character. Whether that was the cause or not of the sudden disappearance I do not know. Some of the shepherds tell of particular days of heavy rain succeeded by hard frost as one cause, but I have not a sufficient recollection of that, and my shepherds do not consider that to have been the cause on our land as it was never spoken of among us at the time.

468. That was in the month of April?—Yes. A very full account of the outbreak at the time will be found in the Transactions of the Teviotdale Farmers' Club. [*See* 395, 488.]

469. On this occasion has the infliction lasted much longer?—Yes, and unfortunately it has spread much more widely. They appeared in the bog land, and after that seemed to be exhausted they moved further up and attacked all kinds of ground, even dry lea ground where there is very little cover. The ravages are very striking as you go from my farm of Eilrig across Commonside and Philip. Most of that has occurred since the new year. I have come to the conclusion that they have not bred on the ground but have migrated thither.

470. Do you think the plague is as bad now as at any time?—We do not see such numbers on the surface, but the mischief being wrought appears to be still much about the same.

471. Have you any suggestions to offer as to the cause and then as to the remedy?—Well, the causes are matters of opinion, and many of us may differ. One cause which can be seen and which all of us are cognisant of is the great scarcity of their natural enemies.

472. Speaking from your own observation, do you remark an increasing scarcity of birds of prey up till the present year?—Yes, up till 1891.

473. Used they to be more plentiful?—On my farm of Eilrig no weasels have been seen. I am not aware that any have been seen at any time. As for birds, kestrel hawks, owls, and the like, they were extremely scarce previously to this outbreak. The Farmers' Club in 1875–76 made application to His Grace the Duke of Buccleuch, as principal proprietor, to give instructions that the natural enemies of the vole should be spared as much as possible, as a means of lessening the plague, and we have good reason to believe that he did so, and that his instructions were carried out very fully at the time; but I have not been giving such strict attention as to be able to say whether the natural enemies have become scarcer since then or not. Previous to this outbreak they were very scarce, but this season short-eared owls have been very plentiful. There are five nests on my farm, and there are more where we see the owls flocking. The presence of these owls is quite a new phenomenon which we attribute not only to the fact that they are spared and protected, but to the plentifulness of voles, on which they live. [*See* 183, 215, 1031, 1572.]

474. Of course if the voles disappear (as we may expect them to do) the owls would disappear also?—Well, that was what took place at the former outbreak. The buzzards were new birds, and entirely disappeared when the voles did.

475. You have not observed any buzzards on this occasion?—No, I have not observed any.

476. (*Mr. Elliot.*) Did you use much feeding on your farm of Eilrig?—Fortunately I did not require so much as my neighbours. I had a good stock of old hay. We began to fodder the sheep generally about the end of October and carried it on till the middle of April. Then I saw I was to run out of hay, and removed about a fourth part of the Eilrig stock to Broadhaugh, and put the Broadhaugh stock on turnip feeding. By that means we not only saved their lives but secured a fair crop of lambs from those we had. The real outlay as I count it is 44*l.*, being at the rate of 4*d.* per sheep per week; then I bought a stack of hay when I began to run out of my own which cost me 20*l.*; then I have had to take two grass fields. This makes 120*l.* which the little farm has cost me for additional feeding.

477. Do you now have a fair proportion of lambs?—They are a very poor quality, and the number is a little below the average.

478. (*Chairman.*) What rent are you paying for your farm?—The true rent is 285*l.* I paid 360*l.* for about 19 years, and then it was reduced in some bad years to 285*l.* For six years or so we have had an abatement of 10 per cent. on that, and the present rent is 255*l.* 10*s.* for Eilrig. The rent of Broadhaugh is 400*l.*, and I get an abatement of 40*l.*

479. (*Professor D'Arcy Thompson.*) You have told us that at the time of the previous outbreak the Duke of Buccleuch gave orders to protect the vermin to some extent, have you any reason to believe that that protection was afterwards withdrawn?—I have no reason to believe that it was withdrawn except hearing stray statements now and then that some of the keepers were destroying some of the vermin, but I have no evidence of my own knowledge that they actually did so. I have one of the Chamberlain's letters bearing on this point, in which it is remarked that that instruction to the keepers has never been withdrawn, and yet I find in the same letter the Chamberlain admitting that traps had been set up till the 4th of May 1890, a contradiction, so far, which it is for him to clear up.

480. (*Earl of Minto.*) Do you think there has been any great diminution among rooks on the moors?—No. There were organised raids on rooks in other parts of the country, but they have always been plentiful on our moors. This year they are still more numerous.

481. So that you do not think the organised raids in other parts of the country have done you any harm?—No. A marked proof that they are getting their food among the mice is that one of my shepherds, who could not in former years get his potatoes protected

from them, finds that they have not touched a single "rigg" this year. They are getting their food elsewhere.

482. Do you not think that the traps you refer to were set for crows?—I do not know what they were set for. Mr. Lockhart merely says that the traps have not been set since the 4th May last. The crows (*i.e.*, rooks) do take the voles. I have found voles where there had been crows which I had frightened away.

483. Yesterday we noticed that the young grass was coming up on the vole ground, do you think that the grass this year will be inferior in quality?—Not in quality, but it is very thin at the bottom. There is not a bit of ground on my farm fit to give a swathe of hay for winter keep.

484. It will not yield sufficient for winter hay?—No. I have a bit of enclosed meadow which is better, but there is not another bit of ground which used to supply us fit to be cut. I do not speak of what it is at present, but looking forward to the end of July and beginning of August it is impossible that it can be fit to be cut.

485. The supply will be very short?—It will.

486. (*Chairman.*) In addition to the loss you have estimated in regard to under-value, you have to anticipate the loss that will arise from your not having hay?—Yes, and many other losses besides that. For example, we have nearly the usual number of lambs, but they are very inferior in quality. They have to become our future stock, and, in fact, till they are disposed of we shall not get rid of the inferior stock. We have tested that by these severe winters and springs. The stock produced during these seasons is never equal to the stock we usually have.

487. Apart from the voles, was this spring a very backward one?—It was a little cold, but, upon the whole, we had a very favourable winter and spring. We had no protracted storms, and had comparatively a fair winter. All the remedies that have been suggested have been tried. I do not say that I have tried every one of them myself, but they have been tried, and the result of the investigation by our club and my own observations have shown that the way in which the greatest number of mice can be killed is by dogs and men with spades to clap them down. Thousands upon thousands have been killed by this means. All other methods, such as traps and pits, have been of comparatively little avail.

Mr. J. Hobkirk.

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488. (*Mr. Harting.*) You have referred (395, 468) to a report that was published in the "Transactions of the Teviotdale Farmers' Club"?—Yes. Do you mean the report of Sir Walter Elliot with reference to the outbreak of 1876.

489. [*Shown document.*] Is that what you refer to? Would it not be more correct to describe this as published in the "Proceedings of the Berwickshire Naturalists' Club." I ask this for sake of accuracy?—Yes; but I was not referring to Sir Walter's paper, but to the minutes of our own Teviotdale Farmers' Club, not only the minutes quoted by him in reference to the former outbreak of 1875–76, but those which have reference to the present plague. The subject was brought before the club at our March meeting in 1891.

490. James Oliver, Thornwood, Honorary Secretary of the Teviotdale Farmers' Club, handed in excerpts from the minutes bearing upon the outbreak of 1876 as well as the present visitation.

James Grieve, Farmer, West Buccleuch, Selkirk, examined.

Mr. J. Grieve.

491. (*Chairman.*) What is the extent of your farm?—About 3,000 acres.

492. How long have you been on it?—My people have been on it for about three centuries.

493. Have you anything more to tell us about this visitation than we have heard from previous witnesses?—I can hardly state more than is contained in the letter I sent to the Highland and Agricultural Society in January last.

494. You attribute the outbreak to the destruction of birds of prey and weasels and such like?—Yes, that is my opinion.

495. How do you come to that conclusion?—We had no signs of this plague at the time the shootings were let to Mr. Massey in 1889.

496. Did he become the shooting tenant of your farm in 1889?—Yes.

497. What took place then?—He put on keepers with instructions to kill the vermin.

498. Was there much vermin on your farm before that time?—Yes, we always saw a number of stoats and weasels.

499. And birds of prey?—Yes, a good number of hawks.

500. Can you identify species of hawk?—Well, scarcely; I do not know much about different species of hawks.

501. Was it the hawk that hangs suspended over the ground and which we call the kestrel?—Yes, something like that.

502. You observed a good number of these?—Yes, a good number.

503. When Mr. Massey became tenant did his keepers destroy these birds?—Yes, by trapping.

504. Have you seen the traps?—No, I did not see them, but the heads of the hawks were hung up on a board at the shepherd's house where he was staying.

505. What number of vermin were killed?—He killed upwards of 100 weasels in two seasons. He stayed 18 months with my shepherd.

506. May I ask how you know the number?—I know from the shepherd. Another shepherd saw them too.

507. The increase in the voles began after this had taken place?—Yes, in the back end of 1890.

508. Has the damage been very great to your land?—Very great.

509. Is there any diminution now in the number of voles?—I can scarcely form any opinion, because they are breeding, and are more into the ground than they were last year.

510. Did anybody interfere with the weasels and hawks before?—No.

511. Is there much game on the ground?—There is not much game on my farm, a few blackcock and a very few grouse.

512. What do you suppose it has cost you?—I have a written statement here.

513. You hand in a statement which shows that in 1890–91 you estimate the loss in the weight of clip at 25*l.*, and of deficiency in the number of lambs at 95*l.*, coupled with their inferior quality; in draft ewes, 50*l.*; and in hay supplied to the sheep, 40*l.* That is a total loss of 210*l.*?—Yes, for 1890–91.

514. And for this year from the same causes added to the cost of wintering stock you estimate it at about 900*l.*?—Yes, but something comes off that for grass relet.

515. The loss on grass for the present season at 911*l.*, less 90*l.* for grass relet, leaves a net loss of 821*l.*?—Yes.

516. (*Earl of Minto.*) In your letter of 28th January you say that in the last three months you killed upwards of 13,000 voles; do you still continue to kill them?—We have been killing them whenever we have the time.

517. Do you think that this has produced any effect?—It has produced very little *apparent* effect, but still we are under the impression that they are certainly fewer.

518. (*Professor D'Arcy Thompson.*) Have you any traditions of previous plagues within the last 300 years?—I have no recollection. The plague of voles of 1875–76 did not affect us. They were more numerous generally, but we suffered nothing.

519. (*Mr. Gillespie.*) What is your rent?—700*l.*

Mr. J. Grieve.

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520. In 1875–76 was there a considerable number of vermin on your farm?—Yes, we have always had a number of weasels.

521. Much more than in 1890–91?—Yes, there were none seen at all till this spring.

522. (*Chairman.*) You attribute the outbreak to the destruction of weasels by Mr. Massey's keepers?—That is my opinion.

523. Therefore the destruction of the 100 weasels mentioned has cost you about 1,000*l.*?—It appears so.

524. (*Earl of Minto.*) Do you think the voles spread from Eskdalemuir to other farms?—I cannot say. I think they broke out about the same time as on my own. They were on Eskdalemuir before I had them.

525. (*Mr. Harting.*) Have you any moles on your farm?—Almost none.

526. Have you heard it asserted that moles destroy the field voles?—I could not say, because we have no moles with us.

Mr. J. Johnstone.

JAMES JOHNSTONE, Shepherd, West Buccleuch, examined.

527. (*Chairman.*) How long have you been there?—Four years. I first went in 1888.

528. After you went there in 1888 did you notice many voles?—There were a few, but they did no great damage.

529. When did you notice them first in great numbers?—About 18 months ago.

530. What time of year?—About the new year.

531. Were any steps taken to destroy them?—Shepherds and dogs killed a good many.

532. Have you noticed the destruction of weasels and hawks on your land?—Yes.

533. Can you tell us something about that?—A gamekeeper stopped with me for 18 months.

534. How long had you been at West Buccleuch when he came to you?—Twelve months.

535. During that time did he kill many vermin?—Yes, he killed a good many.

536. What kind?—Different kinds. I do not know the names of them.

537. Were they weasels?—Yes, both big and little.

538. How many did he kill?—I could not say the exact number, but there would be nearly 100. They were commonly nailed on a door.

539. Was he an Englishman?—Yes.

540. What was his name?—Robert Bell.

541. Did he kill any hawks?—He had two or three hawks' heads hung up. I think they were shot, but I could not say.

542. When did the sheep show signs of suffering from the voles; did they do well in the summer of 1891?—No, they did not. They began to fall off then. It was the ground that was to blame.

543. How did they get through the winter?—They did not do very well, and a good many had to be removed.

544. Then did you give them hay?—Yes, those that were at home got hay.

545. What kind of lambing season had you?—Very bad.

546. What was that owing to?—Scarcity of feed and the sheep being very lean.

547. Would you call it a favourable season as regards weather?—Yes, it was very good weather for lambing.

548. Besides the weasels' tails nailed on the door did Robert Bell leave a number in your house?—Yes, there were some left in a piece of paper in a drawer.

549. Did he get an allowance for each tail?—I could not say.

550. Was it just to show that he was doing his work that he kept them?—It is likely.

551. (*Professor D'Arcy Thompson.*) Do you know how much ground this one keeper had to look after?—I do not know the acreage, but he was on five farms.

552. (*Chairman.*) That would be five sheep farms?—Yes, Dalgleish, Gair, Ropelawshiel, and East and West Buccleuch.

553. Do you happen to know if the voles were spread over the country?—They were.

554. Have you any remarks to offer in addition to what you have told us?—No.

Mr. J. Anderson.

JOHN ANDERSON, Porter, Hawick Railway Station, examined.

555. (*Chairman.*) What have you got to tell us; I do not suppose you have got voles at the station?—None.

556. You were 13 years at Nether Cassock?—Yes.

557. And 3½ years somewhere else in the same parish?—Yes.

558. Did you observe any destruction of birds of prey?—Yes, I could see pole traps from my door.

559. What was your occupation then?—Coachman and help to Mr. George Oliver, now deceased.

560. When did you see the pole traps?—It was two years in May last since I left, and four years before that it commenced, I think after the Duke of Buccleuch's shootings were let.

561. Did they kill many hawks?—They killed a good many, both red and grey hawks.

562. Did you ever see a buzzard caught?—No, we never saw any of them.

563. Have you any means of knowing how many hawks were killed altogether?—No, but I know that they killed a good many of them.

564. Is there much game there?—Yes, grouse and black game.

565. As to weasels, did you observe any killing of them?—Yes. they were killed to a great extent in two different ways.

566. How?—One way was by traps something like rabbit traps, but plain on the face, so as not to cut the legs off, and covered with a bait to attract the weasels. The other way was with a big flat stone set on three small sticks, and a bait in the middle. When the weasel pulled the bait it dropped the stone on the top of it. They killed a considerable number in this way.

567. Is it your opinion that the increase of voles was caused by the destruction of the vermin?—I think so, to a great extent.

568. (*Mr. Elliot.*) What farms were these traps on?—Nether Cassock, Dumfedling, Fingland, Davington, Johnstone, and Craighaugh.

Mr. C. Scott.

CHARLES SCOTT, Ettrick Hall, examined.

569. (*Chairman.*) What extent of land do you hold at Ettrick Hall?—About 900 acres, and I have another farm, Nether Hall, which is something like 1,500 acres.

570. Have you known the land long?—I have farmed it for about 28 years.

571. Have you noticed an increase in voles lately?—An immense increase.

572. Have they done you much damage?—A very great deal.

573. Have you tried any means to get rid of them?—We have tried terriers and other means, but not to much purpose.

574. Have you been able to make any estimate of the loss caused you since the first appearance of this plague?—I have not exactly estimated the cost, but I can tell you what has been spent on stock this year. The two birsels have cost me about 70*l.* for hay and 30*l.* for grass; about 100*l.* since January last.

575. But I suppose it is not an unusual thing for you to hand-feed?—I do not lay it all upon the mice. In a stormy winter we have had to provide hay, but we have had worse winters, and a great deal of the loss was due to this plague. There was less grass on the land at the end of November than I generally saw in March.

576. Have you much mowing land?—Yes, we have some meadow grass, but we depend mostly on the bog land and the hills for hay.

577. What state is that in this year?—Very bad.

578. What was your crop of lambs like this year?—333.

579. What do you reckon an average crop of lambs in ordinary seasons?—700. That is perhaps a large average. It fluctuates, but I should say that 35 score in ordinary seasons is a fair average, or from 30 to 35 score—say 600 to 700 lambs. The average for the last five years is exactly 620, but this includes two seasons of the mice.

580. Have you any suggestions to offer with a view to remedying the plague?—No, sir.

581. Has it beaten you?—Yes. I think the increase of owls and hawks would be the natural remedy, but that would take time.

582. (*Professor D'Arcy Thompson.*) Is there any shooting tenant on your land?—I have the shooting of Ettrick Hall. The other farm is never shot over. I have tried lately to preserve the vermin on my land. Owls are, I think, our best friends.

583. Has there been any special effort to destroy vermin on your land?—No, we used to destroy crows, but now we do not.

584. (*Mr. Harting.*) Have you any "corn-crows" or rooks?—Yes, through the summer, but not very many. I have seen owls on my farm. I have seen on one portion of it six or eight owls, and they seemed to have a good effect.

585. Do they remain all the year?—Yes, they remain the whole year.

586. Are they all one kind?—With me, they are. There is what we call the hill owl [short-eared owl], which I suppose builds on the hills, but the owls with me are the ordinary yellow or barn owl. I may perhaps be allowed to mention that we have a dovecote the top of the hay shed at Ettrick Hall. Last year owls came into the dovecote and I frightened them away. This spring, however, the owls again came, and the pigeons left, and I allowed the owls to keep possession of the dovecote. Yesterday I went up to see what they were doing, and found two old owls and some young ones. Of course I preserved them. We examined the place, which was perfectly thick with the skins of voles.

587. These are the only two kinds of owls which you have remarked?—Yes.

588. (*Mr. Gillespie.*) You spoke of supplementary feeding last winter, was this a year in which there was much need for supplementary feeding in ordinary circumstances?—Not very much, if the land had not been spoiled with mice. We have had much worse winters. My own hay served me till the end of January.

589. When did you first notice a considerable increase in the number of voles?—A year and a half ago.

590. (*Mr. Elliot.*) You have only about half the usual crop of lambs?—Yes.

591. Were your old sheep deficient?—Yes, terribly deficient. The farm keeps 48 or 50 scores and the death rate this year was 140.

592. How much less did you get for your sheep than if they had been in ordinary condition?—The loss was 5*s.* per head.

593. Do I understand you to mean 5*s.* per head in addition to the death rate?—The death rate is over and above that. The average death rate on the farm for the last five years was 45 only.

Mr. C. Scott.
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ROBERT LAIDLAW, Shepherd, Ramsaycleuch, examined.

Mr. R. Laidlaw.

594. (*Chairman.*) How long have you been at Ramsaycleuch?—I have been there for 10 years.

595. Is your land badly affected by voles?—Yes, very badly.

596. Have you tried any means to get rid of them?—Only by killing them with dogs.

597. Has that had any effect upon them?—No possible effect.

598. Have you been obliged to resort to hand-feeding much?—For about seven weeks in the spring.

599. Supposing the grass had been in its ordinary state, was the season such as would require you to hand-feed?—No.

600. What feeding did you give them?—Hay, partly bought and partly grown on the ground. There is no prospect of hay for this year owing to the ravages of the mice.

601. Had you a good lambing season?—Very bad. The ewes were very poor and much reduced.

602. Can you state what difference there was in the crop of lambs this year as compared with former years?—About 15 per cent. below the average of the five previous years.

603. You attribute that entirely to the voles?—Yes.

604. Have you any suggestion to offer to us?—None whatever, because I do not know anything that will destroy the voles.

605. Their natural enemies will take some?—Yes; but weasels have mostly disappeared from the place.

606. Are they killed by gamekeepers?—I have only seen one for the last 10 months I think.

607. (*Professor D'Arcy Thompson.*) Is there a keeper on your ground?—There is, but he does garden and other work, and does not kill any vermin.

608. (*Chairman.*) Is that on Lord Napier's estate?—Yes.

JAMES ANDERSON, Farmer, Braidgair, examined.

Mr. J. Anderson.

609. (*Chairman.*) What is the extent of your farm?—About 1,400 acres.

610. Have you been there long?—22 years.

611. Have you suffered much from the voles?—Yes, of late.

612. What has been the effect upon your sheep?—They have lambed badly and the deaths are heavier than usual.

613. Have you made an estimate of the death-rate?—Yes.

614. To what extent?—It is about six per cent. more this year than usual.

615. What was the lambing season like?—It was a very bad one.

616. What percentage of lambs do you usually expect?—I had 56 per cent. of lambs this year.

617. Is that below the average?—Yes; the average is 85 for the last five years.

618. Are you on the Duke of Buccleuch's land?—No, Pott of Pottburn's land.

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619. Does he destroy the vermin?—No, there have been no keepers on it for 20 years.

620. Are there many hawks and owls?—There were a good many in the summer season, but they went away and are coming back again. There are not many weasels.

621. Have the weasels been destroyed?—No.

622. I suppose these animals kill the voles?—I think so.

623. Are you in favour of preserving them?—Yes, very much.

624. (*Earl of Minto.*) Do you see any diminution in the voles?—There are not so many on the low ground, but they have gone to the higher ground.

625. Have you killed many yourself?—A great many. It has made a difference, but as soon as you give over they return.

626. (*Mr. Elliot.*) Have you any moles on your land?—Yes, plenty of them. There have not been so many since the year 1830.

627. Do they attack the voles?—I do not think they do. I rather think their presence is in favour of the voles, because the latter get into the moles' runs.

628. Do you think that they kill the young voles?—I can hardly say, but I do not think so.

629. (*Chairman.*) Had you much hand-feeding to do this year?—Yes, I hand-fed the whole winter. In former years we did not hand-feed till the 25th April.

630. Will you have enough hay this year?—Nothing like it.

631. Is it on the bog-land you get the hay?—Yes; we have enclosed fields, but one of these has been attacked.

632. So you will be deficient in hay this coming year?—Very much so.

633. Have you any suggestions to offer?—Not that I can think of.

Mr. T. Speedie.

THOMAS SPEEDIE, Craigmillar, Edinburgh, examined.

634. (*Chairman.*) You are a naturalist?—Yes, I have taken an interest in birds and beasts and natural history subjects generaliy for many years.

635. Have you made any inquiry into this outbreak of voles?—Yes, I have taken a great interest in it. There are a good number of them around Edinburgh. In 1889 I discovered some on a lawn in front of a house of which I had charge. They were extra plentiful, and were making holes in the lawn, which was an annoyance. The grass was allowed to grow long, but, now that the proprietor has returned, it has been cut and kept short, and the result is that the voles have entirely disappeared, and the holes have grown up. Last year, when I heard of this plague, I had 50 sent to me alive, and kept them for the purpose of studying their habits.

636. Are they very prolific?—I do not think they are so prolific as the rat or ordinary house mouse. I have never found more than six young ones in a female on dissection, and though I have been rather unfortunate in my experiments to discover the period of gestation, I do not think they breed oftener than the rat. I have a female vole now beside the male, and may draw some conclusions the next time she produces a litter. Last week I killed a number giving suck, but on dissecting them I could not find any young ones. In one instance I found some young ones under a stone, and an old one, which I took to be the mother, contained some young. I do not think they receive the male on the same day they produce their litter, as is the case with the rat, but perhaps I shall find this out some day.

637. Is that the case with the rat?—Yes; during the rat plague I kept some in the house for the purpose of observing them.

638. What do you call the rat plague?—Some years ago the columns of the newspapers were filled with accounts of a rat plague in the same way as they are now occupied with the plague of voles. It was chiefly in East Lothian.

639. Have you any acquaintance with the habits of the lemming?—I have been twice in Norway and among the Laps. The lemmings were very thick when I was there, and what astonished me was that our pointers gorged themselves with lemmings, vomited them, and began to devour them again. The lemming is somewhat allied to the vole, and, like it, appears in a mysterious manner in swarms.

640. Have you any remedies to suggest?—I do not believe in poison. I was at Riskenhope with Mr. Deans Ritchie about a fortnight ago, and we had some of the German poisoned grain with implements to put it into the holes. We caught a chicken, and I put 36 of these poisoned grains into its crop, but it was all right next morning. Last week I put some more of this poisoned grain amongst the captive voles in my house, and they would not touch it, except in one case where I starved two of them into eating it. Afterwards, on dissection, I found some of the pink colouring matter from the grain (aniline dye) in the stomach of one, but I am not sure that they did not both die of hunger. Certainly they will not eat the poisoned grain if they can get grass.

641. (*Earl of Minto.*) Have you noticed anything as to the proportion of the sexes?—I have made that a special study all my life, with deer, dogs, rats, and voles, and I do not think there is any disparity. One day I killed a great many males, and last week nine out of every 12 were females.

642. Did the rats disappear suddenly from the Lothians?—Well, they became quiet.

643. Was there any definite cause for this?—Sir David Baird presided over a large meeting of farmers at Haddington, and asked every one to commence killing the rats in every possible way, and report every week the number they killed.

644. That rather points to an organised slaughter of the voles being possible. So far there appears to have been no organised killing?—Personally I do not think that anything man can do in the way of killing will be of any use. At this time of year, in former years, if you had gone up the Ettrick, you would have found numbers of rooks over all the fields of Philliphaugh. This year there is not one to be seen. They are all hunting for mice on the higher ground. Almost every carcase we found on the high ground was torn to pieces by the rooks. I shot half a dozen rooks and found their gizzards packed with mice. The young mice had been swallowed whole, and parts of the adult mice were also found. Another enemy to the vole which nature has provided is the short-eared owl. In the spring months I have been over most of the hill lands in Scotland from Caithness to Wigtownshire, and I never knew of short-eared owls nesting in this country till the present year. Now I have no hesitation in saying that in the pasture lands which drain into the Ettrick there are at least 100 nests of this owl, and what is peculiar is that these birds have been laying at least double the usual number of eggs. [*See* 183, 215, 473.] If we can get them to remain with us it is easy to see how they and the rooks will reduce the number of voles.

645. You do not think that rooks have decreased much by reason of the slaughter of them in the low country?—Well, I do not know about rook-shooting round here, but my experience is generally that since the imposition of the gun-tax rooks have increased to such an extent that farmers in Midlothian have formed a club to kill them during the egg season. They give cartridges for the purpose, and although I have always opposed the system, I had to join to the extent of giving out cartridges. As I said before, cutting the grass caused the voles to disappear from the land, so I consider that the rough bent grass in which they live should be burned. I do not wish to speak dogmatically, but I think that the rough white grass, where it has not been destroyed by the mice, should be burned judiciously so as to prevent them from harbouring there. I believe that mild winters have been favourable for them, and last winter, when there was a great deal of snow, was also favourable to them. Black frosts help to destroy them.

646. (*Professor D'Arcy Thompson.*) Do you blame the over-destruction of vermin as one of the causes of the plague?—No; at the head of the Ettrick there are

no gamekeepers, roughly speaking, for 10 or 12 miles. Our own owls do not fly so far afield. The tawny owl doubtless kills a number of mice, but if it can get finches and other birds it does not devour many mice. The long-eared owl, on the other hand, preys a great deal on mice.

647. In Norway the lemming becomes excessively numerous, although vermin is relatively abundant. Are not hawks, weasels, and polecats numerous there?—Yes, but these birds and beasts follow the lemmings wherever they go.

648. But on the other hand, if the destruction of vermin does not primarily cause the plague, yet there might be an argument for keeping the vermin in order to cure such a plague when it arises from other causes?—Yes. There is the great visitation of these owls, and I venture to affirm that when the mice depart, so will the owls. The tawny owl will not come up to these hilly districts away from trees. It is the short-eared owl which breeds in the heather, like the grouse, and which comes here with the plague of mice. In the same manner, I may mention, that at one time there was a blight in the gooseberry bushes at Craigmillar Gardens caused by the presence of a caterpillar which ate all the green leaves. A flock of cuckoos arrived and remained in the vicinity till the bushes were washed with a solution of hellebore, when they all departed. Wherever there is a plague of any sort nature generally provides a remedy. About stoats and weasels, I do not believe much in their utility here, because these hills are not their natural or usual habitat. Generally speaking, you find weasels beside field-dykes, or in hedge-rows. Stoats are very migratory in their habits. I do not therefore rely so much on stoats or weasels, but certainly I would urge that the owls and kestrels should be preserved. It has been said that sparrow-hawks kill mice, but I have dissected many hawks and never found a mammal in the peregrine, the sparrow-hawk, or the merlin. I have taken four mice out of one kestrel, and owls will eat four or five in the day.

649. Do you suppose that there is something periodic in the phenomena of life in these rodents that causes them to multiply more at one time than at another?—I do. It is unquestionably the same with the lemmings in Norway.

650. (*Mr. Gillespie.*) You say that you do not believe in weasels in connexion with this matter?—I believe that they will kill voles, and have seen them do it, but I do not believe that these hills are the chief haunts of the weasel.

651. Still, if weasels are on the hills in the parts where this plague abounds, do you not think it would be advisable to encourage them?—I would not discourage them certainly.

652. If they were in sufficient numbers they would check the voles?—If in sufficient numbers; but, generally speaking, in Scotland they are not in sufficient numbers. Of course every vole killed is assisting, but I do not believe much in the help rendered by weasels, for they are not numerous enough. [*See* 505.]

653. Have you any observation as to the relative number of kestrels on such hill land? Do you think more of the birds have been killed in 1890 or 1891 than for a series of years previously?—I do not think so, but the opposite. I have always urged the sparing of them. I am convinced that their food is mice, beetles, caterpillars, and what are known as "hairy hobbies," but chiefly mice.

654. (*Mr. Elliot.*) You think it would be a good plan then to burn the grass?—Yes, in the spring months; but that is a point more for the farmer. Certainly it would be a good thing for getting rid of the mice, because it would expose them more to their enemies.

655. You said the deep snows of last winter, in your opinion, helped the voles to increase; when did these deep snows occur?—I could not give the precise dates, but wherever there has been a deep-snow wreath they have lived and thrived. I found the grass much destroyed where the wreaths had been.

656. Would you suggest that a hard winter favours the voles?—I suggest that deep snow is in their favour. They find shelter under the snow, but a black frost kills them.

657. Does black frost kill them?—I believe so, especially if there has been hard weather previously.

658. Have you personal knowledge of that?—I cannot point to any particular instance, but all my life I have been under the impression from general observation that if you have a hard black frost there are fewer of these little animals than when you have snow. I am speaking generally of the low ground.

659. (*Mr. Harting.*) Can you tell the exact period of gestation in the vole?—Not exactly; I have one which littered yesterday, and when she litters again I shall know.

660. Are you aware that the period of gestation in the long-tailed field-mouse is three weeks?—No.

661. Can you say from your own observation how many times the short-tailed vole will breed in a season?—I cannot say exactly.

662. Will you produce some of the poisoned grain to which you referred?—Yes, here is some. (*Producing it.*) This we received from Germany.

663. Do you know the nature of the poison?—No; but I think it must be arsenic.

664. The poison is strychnine, and the grain is coloured with aniline dye so that it may not be used for any other purpose than that for which it is intended. Have you made any experiments with it?—I put about three dozen grains into the crop of a chicken and this did not kill it.

665. You distinguish, of course, between the size of the animals experimented upon. The quantity required to kill a vole might not kill a chicken?—True, but it is not sufficiently strong, or 30 grains would have killed the chicken.

666. You do not then consider it very effective?—No; besides I would discourage the use of it because it might kill the owls as well as the voles. There is not much danger in it to game.

Dr. Hamilton, Hawick, examined.

Dr. Hamilton.

667. (*Chairman.*) You are a medical practitioner in Hawick?—Yes, I have been in this district for 16 years.

668. You took some part, I think, in an inquiry about the outbreak of voles in 1876?—Yes, I sent out a number of circulars to the farmers and societies in the district, and got back replies which I summarised. The general idea at the time was that the plague arose from the destruction of the birds of prey, particularly in the district affected, and to the overgrowth of grass on the hills; because the period in question had been preceded by a series of luxuriant years at Howpasley and the upper part of Teviotdale. It was attributed by others to neglect in cutting the grass and to the loose draining of the hill land.

669. Do you think there is anything in that?—I got the opinion entirely from old shepherds and farmers who seemed to think that thereby the voles were afforded better protection from their natural enemies. They like shelter, and do not live on bare ground.

670. What did you notice in regard to the disappearance of voles in 1876?—The impression at the time was that they disappeared after three very stormy days in the beginning of May. There was sleet, snow, and hard frost which destroyed a great number of lambs even at that time of the year, and birds and other small animals. The voles were not seen in such numbers after that. I do not say there was no disease to account for their disappearance; in fact I could get no dead ones, and where they went it was impossible to discover. I have been following up my inquiries since 1876, but I am speaking now about the epidemic of 1876.

671. Have you found that they are subject to disease?—They are so just now. About a fortnight ago I came over the hill to see the nest of a kestrel. On coming down I killed two voles which were covered with a swarm of *pediculi*. They seemed quite stupid and were slow in their movements. That was about seven miles from Hawick. These were the only two I killed in that condition. They were very thin, and the fat above their

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shoulders had entirely disappeared. They were swarming with *pediculi*.

672. You did not observe that in 1876?—No, I have often seen lice upon them but never in such numbers as upon those two.

673. Have you made any experiments as to remedies?—I have been experimenting. I believe that the destruction of the kestrel is one cause of the increase of voles. Many keepers mistake the kestrel for the sparrow-hawk, and shoot it, though it is a bird that would not hurt game at all. The magpie is another natural enemy, and it has disappeared. I have not noticed a buzzard though I believe they are here, and there are very few weasels. Foxes are very fond of mice, and destroy great numbers of them. I would suggest that foxes, weasels, kestrels, owls, and buzzards be preserved and that more hay be cut.

674. (*Professor D'Arcy Thompson.*) Do you suppose that there is an epidemic disease appearing among the mice apart from these *pediculi*?—Yes; mice are all subject to *pediculi*.

675. You have no further idea as to the nature of the disease?—No; they were very thin, that was all.

676. (*Mr. Harting.*) Has your attention been called to the experiments of Dr. Loeffler;—Yes.

677. That is the inoculation of mice with a bacillus?—Yes. Some years ago I injected voles with the virus of typhoid, but they died in a short time, and the experiment (so far as the spread of infection was concerned) was not successful. I believe the one thing necessary is to get the virus in such an attenuated condition that the mice which have been inoculated will live long enough to infect their neighbours. That is what is wanted, if it is possible for man to do anything. They cannot be destroyed by dogs, and if man can do anything to exterminate them it is by inoculating them with some infectious disorder.

678. Statements have gone forth that the result of the experiments of Dr. Loeffler has been that the individuals experimented upon have died without having infected their neighbours?—I have not tried his virus, but the voles I injected with typhus virus died very quickly, and the experiment was by no means successful.

679. That being so, this system would have no advantage over any particular poison equally rapid in its effects?—I disapprove entirely of poison. I believe inoculation would be safer.

680. Would you recommend that experiments should be made?—Most certainly. It is the only way that I can see by which anything can be done to reduce the plague. The voles will always be with us, but they might be reduced to such numbers that their natural enemies would keep them in check.

681. Do you think that if the proper virus for inoculation could be procured it would be worth while for the Committee to make experiments with it over a limited area?—Yes, I should say so as a medical man.

682. (*Professor D'Arcy Thompson.*) Do you recommend that in face of the statement that the disease is said not to be infectious from one mouse to another?—That is said to be the case, but at first it was asserted to be infectious.

683. So far as I understand, under Dr. Loeffler's first experiments the mice ate one another and thereby acquired the disease?—That, of course they would not do in a wild state. My idea is to inject the typhus so that the inoculated mice would infect each other. I would not infect them by strewing the poison about, although I do not think it would be very dangerous as it is a mineral poison.

684. What you want is something wherewith to inoculate one mouse so that it might infect all the rest?—Yes.

685. You do not understand that as yet Dr. Loeffler has failed to effect such a result?—No, I understand that he had almost succeeded in obtaining that result from the last notice I saw of his experiments. It is on that line the experiments are being carried out just now. I have been trying to discover something which through one will infect the others. If we could spread a disease amongst them that might do, but upon that I have my doubts. I believe that in some cases the ground has got poisoned and the animals have been starved.

686. You would not recommend the adoption of any such plan I presume until after a series of experiments had been made to prove that it is harmless not only to human beings but also to domestic animals and game birds?—It would be necessary to ascertain this, but I do not know that birds would die from mouse typhus. I experimented with the typhoid virus, and was of opinion that it would be perfectly safe, but of course if it were found to affect birds or dogs, I could not recommend it. We would require to be sure upon that point.

Mr. A. Scott.

ADAM SCOTT, Shepherd, Commonside, Teviothead, examined.

687. (*Chairman.*) Have you been long at Teviothead?—24 years.

688. Have you tried burning as a remedy to get rid of the voles?—Yes.

689. With what results?—On the heather it had some effect, but not on the grass. The grass burned, but it did not raise such a strong fire as the heather, and I saw mice on the burned ground afterwards.

690. Suppose you burned the grass, how would you keep the sheep?—We should have to burn a part only.

691. The rough grass is useful for the sheep in winter?—Yes, we have nothing else for them, unless artificial food.

692. (*Mr. Gillespie.*) In burning either the heather or the bare ground, do you think that many voles were actually killed?—On the heather we killed a good many, but few on the bare ground.

693. (*Mr. Elliot.*) Would you recommend burning a larger portion of the land, whether heather or bent?—I would recommend burning the heather; it is a great harbour for mice.

694. Would that not be against the sheep?—Well, part of the heather is dying where the mice are numerous, and it would be better to burn it.

695. Would you recommend burning the grass alone?—We tried it this year, but I could not say that I would reoommend it now. Where it is infested with the mice it is not coming well, and sheep cannot get feeding on it. I could not recommend burning it, conscientiously, though we burned a great deal this year.

Mr. S. Clark.

SAMUEL CLARK, Farmer, Chapelhill, examined.

696. (*Chairman.*) Have you been tenant of Chapelhill for some years?—Yes, for 13 years.

697. What is your opinion of burning as a remedy to get rid of the voles?—I have tried it and it has very little effect upon the voles upon any sort of land.

698. What kind of land have you tried it on?—Both heather and lea land.

699. And you found the voles as bad after the fire passed?—Yes, quite as bad. They betook themselves to the holes and remained till the fire was over.

700. Is it your opinion that burning as a remedy is a fallacy?—Yes.

701. Have you any remedy to suggest?—Inoculation is the most likely remedy I have seen suggested, but of that I have had no experience.

702. (*Professor D'Arcy Thompson.*) Have you observed much diminution yet in the number of voles?—None whatever.

703. (*Chairman.*) Have you suffered much damage in consequence?—Considerable damage, but not nearly so much as several other farmers have.

John Oliver, Solicitor, Hawick, examined.

Mr. J. Oliver.

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704. (*Chairman.*) What is your occupation?—I am a solicitor, and am tenant of Lynwood, in the neighbourhood of Hawick. I have a farm of upwards of 3,000 acres.

705. Has it been affected by the voles?—It has, since about Christmas time.

706. What brought them there; were they driven off other land?—They left other land because it had become foul and they had eaten up the pasture. They left the affected district and came over to a fresh piece of country, and arrived at my farm at about Christmas.

706*a*. Have you tried burning?—Yes, to a large extent.

707. With what result?—The result was that the voles took refuge under the ground in their holes. A great deal depends on the nature of the ground burned. If the soil is deep the holes are deep. If the soil is not deep it is bare rocky ground. If it is deep the burning is of no use, as the fire passes over them so quickly that they remain uninjured.

708. You cannot afford to burn everything?—We cannot burn the whole extent of ground. We only burn the bad land.

709. Otherwise there would be nothing left for the sheep?—We did not burn the bottom land where the sweetest grasses grow. We burned the coarser land where the bent grows. In connexion with the burning of another farm with which I had to do, and which I had been frequently upon and watched the effect of burning, I found that where the ground had been either burned or mowed during the season of 1891 that the voles were not so bad upon it during the winter of 1891–92; because the ground was bare and there was no harbour for them. If you burn one place they leave it for another, but the burning has this good effect, that it leaves the ground fresh and clean.

710. (*Professor D'Arcy Thompson.*) I see by your letter to Mr. Elliot (Appendix I.) that you employed a man at Glenkerry for a month killing voles, and that he killed 15,000; did you continue him in that employment?—He had to cease about the Martinmas term. He killed for six weeks at the rate of something like 450 voles in a day with a couple of dogs and a spade.

711. Do you not suppose that a continuance of such operations (especially if undertaken simultaneously by a number of farmers) would be to a great extent effectual? Would it not take a great number of natural enemies to kill so large a number as that?—It would, indeed. Where the voles get so numerous and the natural enemies do not increase at the same time the balance of power is disturbed.

712. Why did you not continue employing this man?—The man was a servant on the farm, and at that season of the year referred to he was not very pushed with work, but about the middle of November he was taken to something else.

713. (*Mr. Elliot.*) Would you as a practical farmer recommend burning from year to year?—Not from year to year. It is not necessary to burn so often as that. We burn the coarse hill land quite independently of the voles for the purpose of cleaning it occasionally. It should only be done at intervals of at least three years.

714. Was the stock affected on the farm on which you killed such a large number of voles?—Yes, it did a great deal of harm to the stock. A large number had to be removed, and what were left had to be fed on Indian corn and cake.

715. Is this stock all back again?—Yes. The crop of lambs will be a little below the average, and a very large expenditure was laid out upon them.

716. Can you state the amount?—120*l.*, as nearly as may be.

717. (*Mr. Gillespie.*) Is it the farm of Glenkerry you are speaking of?—Yes.

718. When was there a large increase of voles noticed on this farm?—It was before 1890.

719. Your shepherd had written a letter to the newspapers drawing attention to what he called a plague of voles in 1888?—They had been noticed at that time, but they were not then doing any harm. They gradually increased.

720. Simultaneously with the increase of these voles in 1888, and immediately afterwards, was there an unusual destruction of weasels and other vermin?—Well, there was no shooting upon the farm and no means were taken to kill them at all.

721. (*Mr. Harting.*) What, in your opinion, is the best remedy?—The best remedy I know is killing them with men, dogs, and spades. I know of no better.

Alexander Scott, Farmer, Ladhope, examined.

Mr. A. Scott.

722. (*Chairman.*) Are you tenant of Ladhope?—Yes; it is a farm of about 2,000 acres, and I have known it for a long time.

723. You have come to speak to one or two facts in connexion with this inquiry?—Yes.

724. Have you tried poisoning?—Yes.

725. With what result?—My ground is generally hard, and voles have never been so bad upon it. I tried poisoning in March, and I think it had a good effect. At first I put it in drain tiles, but as it did not draw them, I put it into the holes and they took it then.

726. Was it poisoned corn?—Poisoned corn and meal. I used arsenic.

727. You did not see the dead ones?—No; they must have died in the holes.

728. Have birds of prey been much destroyed on your ground?—Not for five years. For four years before that there was a good deal of destruction by shooting and trapping.

729. Were there many killed then?—Yes, there were a good many. I made a complaint to Mr. Lockhart, the Duke's agent, and he stopped it then.

730. Are there a fewer number of hawks now than formerly?—There are not so many as we had. They appear to be drawn to other places where there is more food for them.

731. Do you suppose you have still a good many?—Yes, but not so many as in other places.

732. In 1888 you say you wrote to Mr. Lockhart?—Yes.

733. By whom was this letter written?—By myself and two neighbouring farmers.

734. You complained of the destruction of hawks?—Yes, I produce the answer to the note.

735. The reply was that instructions had been given to stop killing kestrels and owls?—Yes.

736. (*Mr. Harting.*) You have stated that you have tried poisoning with arsenic with good effect?—I thought so.

737. I suppose the result would be that the mice would not always die in their holes, but sometimes upon the surface?—It might be so, but we did not see many.

738. Do you think that birds of prey feeding upon the freshly poisoned mice would be poisoned?—No, I do not think the birds would look at them unless alive.

739. In other words you would say that so-called "vermin" will not take dead prey, but always kill for themselves?—That is my idea.

Mr. C. Scott.

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CHARLES SCOTT, tenant of Milsington, Borthwick Water, examined.

740. (*Chairman.*) Have you tried burning?—Yes, both on heather and bent.

741. What opinion have you formed as to its effect?—Well, we could kill very few mice on the heather, they all got so quickly into their holes.

742. Were the mice as bad on the ground after?—Not where the heather or bent was burned. It drove them to unburnt ground.

743. Of course, on a sheep farm you cannot afford to burn all the ground?—Not the whole of it, but this time I am sorry I did not burn more. The burnt portion is producing better feed for sheep, and the sheep are fonder of it.

744. Have you any suggestions to offer?—The only means I can think of to kill them is to introduce an infectious disease among them. They are very plentiful with me in the heather.

745. (*Professor D'Arcy Thompson.*) You state in the letter to Mr. Elliot referred to that men and dogs were the most effectual means you had seen tried; did you put that in practice?—Yes, to a certain extent, and we killed a good number. My farm is mostly heather, and we could not kill them among the heather at all, but only on the white land.

746. Apart from the voles, the past winter would have been a fairly good season?—Yes, we had a fair winter if it had not been for the voles.

747. (*Mr. Gillespie.*) Do you think that protecting and encouraging the breeding of the natural enemies of the voles would be an effectual check against any future outbreak?—Yes, I think it would, if there were some small plantations for the birds and some shelters for the weasels in the higher districts.

748. Would you recommend additional small plantations for the birds and stone cairns for the weasels?—Yes.

749. (*Mr. Elliot.*) You say that owls and hawks are much more numerous than they used to be, is that so?—Yes, hawks were very numerous through the winter, but they have gone now. I believe some species go abroad for the breeding season.

The following witnesses were brought forward by the agent for his Grace the Duke of Buccleuch:—

Mr. G. Home.

GEORGE HOME, Forester, Branxholm, examined.

750. (*Chairman.*) You are a forester?—Yes.

751. Where?—At Branxholm. I have been acquainted with the district for four years.

752. Have you paid attention to the great increase of voles?—Yes; it was forced upon my attention by their destroying a number of blackthorns I had planted some years ago.

753. Did you adopt any means to get rid of them?—Yes; I dug pits, with the result that they were effectually exterminated in a week.

754. Was it a plantation?—It had been an open fox-covert, and I had orders to plant it with blackthorns. It extended to about six acres, and was enclosed.

755. Outside were the voles spread over the country?—Yes; there was rough grass round three sides of it, and there were a good many in that. The pits were about 18 in. deep, 12 in. wide at the mouth, and 15 in. wide at the bottom.

756. What number of pits did you dig?—I was anxious to have the mice killed at once, and dug pits about 12, 15, or 20 feet apart.

757. You would not think them suitable for a hillside, would you, where they would have to be spread over a great area?—No; but if confined to a moderate area the voles might be exterminated. Fewer pits would have the same effect in a longer time, and in wet weather the pits would fill with water. Within a week I took 586 voles out of the pits. They still remain open on the ground.

758. (*Mr. Gillespie.*) As far as your observation went, did the mice go freely into these pits?—Yes.

759. As far as you counted you got 586 in a week; that would be about 80 or 90 in a day?—Yes.

760. Do not you think that a man working at them would have killed more?—Very possibly so, but it was enclosed ground and very rough with grass, and he would only get a glance at them here and there.

761. You did not calculate how many you had to the acre?—No; they were mostly on the margin.

762. (*Mr. Elliot.*) Did you put any bait into these pits?—I put in a piece of carrot at first, but it had no effect whatever.

763. Do you think pits are practicable on large farms; would they not be dangerous to sheep?—They might be dangerous possibly to lambs, but not to sheep.

764. (*Mr. Harting.*) Are you quite sure that the damage to the trees in the plantation was caused by the voles?—Yes.

765. In previous outbreaks in the Forest of Dean it was ascertained that there were two different kinds of mice, one was the long-tailed field-mouse and the other was the short-tailed vole; are you sure that the animal that did the damage to the trees is the same one that is doing the damage to your grass?—I think so.

766. (*Professor D'Arcy Thompson.*) How many pits would a man dig in a day, roughly speaking?—Well, I can scarcely tell, as I was not taking any note of that.

767. Did you put on many men?—Four or five men and myself for barely six acres.

Mr. W. Barton.

WILLIAM BARTON, Colporteur, examined.

768. (*Chairman.*) You are acquainted with the district of Upper Teviot?—Yes; and my attention has been drawn to the plague of voles.

769. Have you noticed any circumstances in connexion with it?—I do not know. For two or three years there have been many more than there were formerly.

770. We want fresh circumstances?—There are not many fresh circumstances to relate in connexion with them.

771. Have you made any observation as to there being a diminution or increase in the number of their natural enemies?—Yes; there is an increase in the number of hawks.

772. What did you come here to tell us?—I came here to tell what I was asked.

773. Tell us anything you think will be useful to this inquiry?—It is not easy. Two years ago there was a great deal more roughness in the grass, which was favourable for cover for the mice, and there were few natural enemies to cope with them.

774. What kind of enemies?—Such as hawks, weasels, and crows.

775. Were they fewer than they used to be?—Yes, there were fewer crows. I do not know if there were fewer weasels and hawks.

776. You think that the crows keep them in check?—Yes; I have seen nests of mice which the crows had destroyed.

777. I suppose there is a good number of crows throughout the district still?—Yes.

778. Do you connect the increase of the voles with the decrease of the crows?—The one increases when the other decreases.

779. (*Mr. Gillespie.*) Are you in the habit when following your business of going over the hills?—Certainly.

780. You said there had been an increase of hawks lately?—Yes.

781. Was there a scarcity of hawks previously?—Yes, I saw very few.

782. Do you see very few weasels?—I have not seen a weasel for years.

783. Have you been going over the hills in such a way as to have a fair opportunity of seeing weasels?—Yes.

784. And these were decidedly scarce until the last year or so?—I have not seen any.

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785. (*Mr. Elliot.*) You say the crows have decreased; in what district is that?—In the upper district of the Teviot.

786. (*Earl of Minto.*) Have you got any suggestion to make as to the possibility of keeping down the voles?—No.

JOHN MARTIN, Gamekeeper, Bowhill, examined.

Mr. J. Martin.

787. (*Chairman.*) Has your attention been drawn to this increase of voles and the cause of it?—Yes.

788. Have you formed any opinion as to the cause?—I have; the mild seasons and roughness of the pasture.

789. Have you any opinion as to the means which should be taken to get rid of them?—Burning would be the best means. It would not do away with them all at once, but it would burn out the covert they work in.

790. I suppose the sheep farmers could hardly afford to burn the whole of their ground?—I mean that they should burn a portion yearly.

791. The evidence we have is to the effect that when the rough places are burned the voles move off?—Yes, but it burns the ground they work in, and would prevent them coming back for some years hence.

792. We have heard a good deal from various witnesses about what are assumed to be the natural enemies of voles, birds of prey, and weasels, have you any opinion on that subject?—The owl, the rook, and the weasel kill them, sea-gulls also kill them, and foxes kill a great number.

793. The kestrel too, I suppose?—Yes, but not the sparrow-hawk.

794. When your men are killing hawks do they distinguish between one hawk and another?—Certainly. They have not killed any kestrels within the last two years, and very few before that. They only kill them by shooting them. Occasionally they kill a sparrow-hawk by trapping, when they find that it has been killing young birds.

795. Supposing the kestrel to be useful you would not recommend the use of the pole trap?—No, we do not use the pole trap.

796. Are the shootings let in your district?—Yes.

797. Have the hawks been interfered with there?—No, the ground is looked after by his Grace's own men, except on two shootings, and there are no mice there, at least none to speak of.

798. Some people seem to be of opinion that moles attack voles, have you observed anything of that sort?—No, I do not believe it, because I have seen ground in which both moles and mice were numerous in the same part.

799. Have you seen poison tried?—Only with German grain.

800. Do rooks do much good in killing voles?—The rooks are doing more good among them than any other birds. I have often found the remains of old mice and young ones in them.

801. (*Earl of Minto.*) Do you think that before the appearance of these voles there had been any great diminution amongst vermin and birds of prey?—No.

802. In fact the number of vermin and birds of prey has been much the same for a number of years past?—Yes.

803. Are they now increasing through being protected?—Owls are increasing, and also the kestrel.

804. Have you got many weasels?—Not many.

805. (*Professor D'Arcy Thompson.*) Is the short-eared owl a regular visitor to this part of the country?—Usually they migrate, but some remain to breed every year in Scotland.

806. Then their absence in previous years was not due to their destruction?—No. We never kill owls. The mice have attracted them.

807. (*Mr. Elliot.*) You say that the mice brought the owls, have you any idea what brought the mice?—Well, I have stated that already. I have said that their numbers are due to the mild seasons and the roughness of the pasture. They are always on the hills to a certain extent.

808. Has the ground not been always as rough as it is now?—Not until within the last two or three years.

809. I thought that there was a scarcity of grass on non-infected land?—Not within my experience.

810. (*Mr. Gillespie.*) How wide is your district?—About 50,000 acres.

811. Does it go as far as West Buccleuch?—No; only a part of East Buccleuch is included in my ground.

812. Do you mean that the roughness of the pasture protects the voles against destruction by severe weather?—Yes.

813. And also protects them against their natural enemies?—I do not say that it does, but it protects them during the winter.

814. But do you not think that if they are covered by deep grass their natural enemies will have some difficulty in getting at them?—Yes.

815. Has there been a considerable stock of vermin on the ground of which you have charge, such as hawks and weasels?—There are not a great number of weasels, except at Bowhill.

816. (*Mr. Harting.*) You have told us that you kill more owls in your traps than anything else?—Yes, we should do if we set any.

817. As a matter of fact, do you set any pole-traps?—We set none.

818. Your answer to a previous question was that you caught more owls?—No; I meant we would catch more if we set traps for them.

819. Is it not the fact that the short-eared owls disappear before the young game birds are hatched?—Yes; I do not think that they do any damage to game birds. They do a great deal of good in killing mice, and I am prepared to say that they should be preserved.

820. (*Mr. Stratherne.*) Did you ever kill any owls on Ladhope?—Never.

ANDREW WATSON, Gamekeeper, Teviotdale, examined.

Mr. A. Watson.

821. (*Chairman.*) Where do you live?—At Teviotside. The district of which I have charge is affected by the voles.

822. Have you charge of some of the ground which was let to Mr. Massey?—Yes.

823. You have heard the increase of voles accounted for by the destruction of hawks, owls, and weasels by Mr. Massey's keepers?—Yes.

824. Do you think there is any truth in that?—I do not believe that it is correct. I wrote to Mr. Massey, and he sent me a note of what the men killed over the whole 10,000 acres which he shot over.

825. Have you a note of the numbers?—Yes, that is it.

826. This is a letter from Mr. Massey to the *Hawick Advertiser* of 4th March last containing a statement

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that the total number of weasels killed on his ground was less than 30. Have you any means of knowing whether this statement is correct?—Nothing but the men's word. Mr. Massey communicated with his men, and that is their statement. [*See* 866, and Mr. Massey's evidence, 1665.]

827. In short, you do not believe that the increase of voles is due to the decrease of vermin?—I do not.

828. Have you formed any opinion as to the true cause of the increase of voles?—My opinion is that it is owing to the great increase of foul grass on the hills.

829. Would you recommend burning?—Yes.

830. Surely the hills are not so rough as they used to be?—They are not so rough this year, but sometimes they are very rough. We have been assisting the tenants to kill the voles, and we found most of them in grown up drains and where the drains had been allowed to get into very bad order. The grass seems to harbour them. They breed among the grass.

831. But these drains are cleared out periodically?—Never since I came.

832. On none of the ground?—There may have been some cleaned out since. There has been very little burning, and I think that is a very great mistake.

833. (*Earl of Minto.*) Did you know the ground that Mr. Massey had *before* he took the shooting?—Yes, when Mr. Massey came to look over the ground he asked one of the shepherds if there was much vermin, and the reply was that it was "fairly alive"; but when the man was asked how he was getting on he said there was none.

834. Do you think the shepherds kill down vermin?—Well, the shepherds do kill weasels.

835. Have you charge of the ground now?—Yes.

836. Do you see much difference in the vermin on the ground now, comparing it with what it was when Mr. Massey had it?—It is much about the same. Weasels will not stop much up on these high ranges.

837. Why do shepherds kill the weasels?—Well, they seem to have an enmity to weasels like everybody else. It is certain sure they kill them.

838. (*Professor D'Arcy Thompson.*) Are you in the habit of sparing owls and kestrels?—The only hawks we kill are the sparrow-hawk, the merlin, and the glede.

839. (*Mr. Elliot.*) You say the shepherds kill the weasels; did you ever see them killing weasels?—I had the fact that they kill them from one of his Grace's watchers.

840. You have been 11 years there; has the grass turned very much rougher within that time?—The grass has been far rougher than it was this year, and I have often impressed upon the shepherds to burn it down as I thought it would be an improvement. There has been comparatively no bent burnt since I came here.

841. Do you not think that the tenants of the lands, with the advice of their shepherds, should know best what is for their own interest?—I think so. When I spoke to them about burning the bent, they wanted to keep it for hay.

842. Would you set your opinion against that of all the practical farmers in the district?—Well, I had the opportunity of walking over the land and seeing the farms, and am giving you my opinion fair and square.

843. We have had evidence of weasels having been killed by keepers; you say you do not believe it?—We kill the weasels, but at the same time the shepherds kill them too.

844. Do you believe the letter from Mr. Massey that there were only 30 killed?—Well, I have nothing but his word for it. [*See* Mr. Massey's evidence—1665.]

845. Do you believe it?—Well, he says that he only killed 30 on Buccleuch.

846. I ask you if you believe the letter and do not believe the evidence of the other witnesses?—I have no cause to disbelieve it.

847. What cause have you to disbelieve the other evidence?—I do not know what you mean.

848. You said you did not believe the evidence that there were a hundred weasels killed on Mr. Massey's ground, and I ask you what reasons you have for disbelieving it?—[No answer.]

849. (*Mr. Gillespie.*) What part of his Grace's lands tenanted by Mr. Massey had you charge of?—West Buccleuch, Ropelawshiel, Gair, and Wolfcleuchhead.

850. In the exercise of your duties were you at West Buccleuch during the time that Mr. Massey's man was lodging there?—I have been occasionally across the ground.

851. Were you ever at the place where he lodged?—No, I never was there.

852. You say that the shepherds kill the weasels; do you know by what means?—With dogs and sticks.

853. Do you believe that the watchers encourage the shepherds to kill them?—I do not think so.

854. Do your men kill a great number of weasels?—Well, we have killed a good few yearly, and we give in an account to his Grace.

855. Do you kill as many as come in your way?—It is only for a few months in the year that we set traps for weasels, for we are away in the hunting country. It is a district in which there never have been many vermin killed.

856. Do farmers in the district where voles prevail follow a different practice as regards burning from that followed by farmers in parts which are not affected, such as Liddesdale?—In Liddesdale they burn and mow more.

857. Is the ground there not an evener surface than here?—Well, it is somewhat flatter ground, but there is plenty of flat ground in this district too.

858. (*Mr. Harting.*) Do you say that the number of weasels killed on Mr. Massey's estate, whether 30 or a 100, has not materially affected the number of voles?—It really could not do so on a small portion like that.

859. As far as you are able to judge, the statement as to the number killed is somewhat exaggerated?—I believe that to be the case.

860. You told the Committee just now that you always kill the merlin; do you know what the birds feed on?—They kill grouse.

861. Do they not live more on small birds?—No.

862. Are you of opinion that the merlin kills grouse?—Yes.

863. Do you know the weight of a merlin as compared with that of a grouse?—It is not very heavy.

864. Have you seen a merlin kill a grouse?—Yes.

865. You are sure that it was not the male peregrine?—No, there is scarcely such a bird in this country.

866. (*Mr. Gillespie.*) Can you give us any general idea as to how many weasels are killed, on an average, every year on the ground under your charge?—Not much over 100 for the whole of the men.

867. How many men are there?—Five and myself.

868. What area of ground have you charge of?—58,000 acres.

869. Do not you think if it is assumed that 100 weasels were killed on West Buccleuch in a particular year, that they and their natural produce if unmolested would have had a great effect in checking the number of voles?—No, it would not, because the ground was alongside Eskdalemuir, and half of the weasels might have been taken from another district.

870. What reason have you to assume that they were trapping on the Eskdalemuir side?—The man was put there to look after this 10,000 acres. I have nothing to do with the other side. If a man is trapping alongside his neighbour's property he may get some of his vermin.

871. What is the general food of weasels?—Hares and rabbits.

872. Mice, if they come in their way?—Yes, small weasels, but I never saw a stoat interfere with a vole.

873. (*Mr. Strathern.*) What difference is there between the large and the small weasels?—The one is about half the size of the other.

874. (*Mr. Gillespie.*) Were these weasels that the keepers saw in the hands of the shepherds killed by the shepherds?—Yes, they are included in this list, and I can give the names of those who hunted for them.

875. (*Mr. Strathern.*) I undertook on behalf of his Grace to furnish a return of the number of vermin killed for five years over the districts referred to.

JOHN S. KERSS, Head Keeper, Langholm, examined.

Mr. J. S. Kerss.

21 June 1892.

876. (*Chairman.*) What is the area of land under your charge?—About 100,000 acres.

877. Has any portion of your district become infested with voles?—Yes, both Eskdalemuir and West Craig, part of Ewes, and part of the parish of Langholm.

878. You have heard that the increase of the voles is attributed to the decrease of their natural enemies; have you formed any opinion with regard to that?—There is no doubt that hawks and owls take voles, but I do not think they live upon them for the greater part of the year. If they did they would likely become unhealthy.

879. What leads you to that opinion?—All animals must have a change of food. If you feed dogs on meat alone they will take mange.

880. Have you any apprehension about the state of health of the owls that have been living on voles for six months past?—They seem healthy enough, but that is only a question of a few months. The owls are in ordinary seasons very scarce in this country.

881. You have not observed any effect upon the health of the kestrels?—Some of them have been found dead, but I have not seen them.

882. Dead from disease?—Evidently, because orders were given that none were to be shot, and it is since that order was given that these have been found.

883. Do you attribute that to a surfeit of voles?—I have no doubt it would have that effect in the long run.

884. Do you know anything about the destruction of hawks and weasels on the shooting rented by Mr. Massey?—I know that vermin were killed there, but I do not know the actual figures. Before it was let, the Duke had one keeper on it, and Mr. Massey put on an extra man. I daresay it extended to about 29,000 acres.

885. That extra man would no doubt destroy the vermin?—No doubt he destroyed some, but not sufficient to account for the increase in the voles.

886. Can you attribute it to any other cause?—I think the roughness of the pasture two years ago. If burning was resorted to more generally in regular rotation it would help to keep the mice down, because I notice that ground which was burned or mowed two years ago has not been worked by the voles to any great extent, except where a wreath of snow had spread over the ground and the voles had gone underneath.

887. Is it not the general opinion of practical farmers that as much burning is done now as can be done?—I was in Eskdalemuir on Tuesday and Wednesday last week, and they were very sorry there that they had not burned more this year.

888. (*Mr. Gillespie.*) You have said that you attribute the outbreak largely to the roughness of the pastures two years ago; do you mean that the voles would breed more rapidly because of the roughness of the pasture?—Their natural enemies cannot then get at them, and they cannot work without a certain amount of roughness above them.

889. Although the pastures were not so rough previously, the voles had plenty of food in these years?—Yes, but then, you know, that there are good breeding years and bad breeding years for these animals as well as for everything else, and this seems to have been an extra good breeding season for voles.

890. The roughness of the pastures protected them from their natural enemies?—I have no doubt, and it would also protect them from severe weather.

891. Did you get a return during the time the Eskdalemuir shootings were let, of the number of vermin killed?—No.

892. Previously you were in the habit of making up such a return?—Yes.

893. In the course of the year would there be a considerable number of hawks and weasels killed in Eskdalemuir before it was let?—I think probably more.

894. The man under you was in the habit of killing a large number of these vermin?—Yes, before Mr. Massey took the shooting.

895. Would he kill more than 30 a year?—He might kill 60 head of vermin a year.

896. (*Mr. Harting.*) What would he kill besides?—Rooks, and probably hooded crows, because they are very destructive to game and lambs.

897. Do you consider rooks destructive to game?—Yes, to their eggs.

898. Do you consider them useful in any respect?—Some farmers consider them very useful for devouring grubs.

899. Have you any opinion as regards the services rendered by rooks in killing the voles?—Yes; when I was in Eskdalemuir last week I saw lots of voles' nests which had been torn up by rooks. I saw the rooks working there.

900. In striking the balance between the harm done by rooks in taking the eggs of game birds, and the good they do by killing the voles, is it in your opinion better to destroy or to preserve them?—Well, the vole question is a limited question, but the game question affects the whole of Great Britain.

901. You know that in Northumberland the farmers kill large numbers of rooks?—Yes, and in my native country down the Mersey they pay 3*d.* a head for them.

902. Is not that a mistake?—I cannot say that; I only speak from a gamekeeper's point of view.

903. Would you give orders to destroy them?—I would keep them down to a certain extent.

904. Are they numerous on these 100,000 acres?—I have six rookeries, but they are small. In Annandale there are very large rookeries.

905. Do these rookeries increase?—We do not kill the old rooks, but starve the eggs.

906. (*Chairman.*) As an experienced gamekeeper would you object to the preservation of kestrels, owls, buzzards, and weasels? Do you think your game would suffer?—It would suffer nothing from owls, little from kestrels, a good deal from weasels, and I would not on any account destroy buzzards because I think on a large estate like his Grace's they would be an ornament and nice birds to have.

907. Can you suggest any remedies?—I have tried poison. The first time I tried it was in my own garden where the voles destroyed the apple trees and plants. I had some boxes made and tried poison, and killed them out. In the parish of Westerkirk I used drain tiles for putting the poison in. We did not see a great many dead voles, but there was a diminution in their numbers. This spring I was in Eskdalemuir for four days, and saw one very bare place on the farm of Clerkhill, and I suggested to Mr. Paterson, the tenant, that I should send up a man to try poison there. He was there for three or four days, but I think Mr. Paterson and the man admitted that they did not mix up the poison properly. It is a very bitter poison, and they had put too much of it into the mixture.

908. (*Mr. Harting.*) When you use the word weasel do you apply that term in the generic sense, including both the large stoat, and the small weasel?—Yes.

909. Do you mean to say that the smaller one of the two is destructive to game?—Yes, to a certain extent, but not to the same extent as the larger one.

910. Would you not say that the smaller animal hunts rats and mice in their runs?—Yes, it goes under the name of the "mouse-hunter."

911. Then you would not consider it so destructive as we have been led to infer?—Not nearly so.

Adjourned to Wednesday the 22nd instant at Moffat.

At Moffat, Dumfriesshire.

FOURTH DAY.

Wednesday, 22nd June 1892.

PRESENT:

SIR HERBERT MAXWELL, BART., M.P., IN THE CHAIR.

THE EARL OF MINTO.
REV. J. GILLESPIE, M.A.
WALTER ELLIOT, ESQ.
PROFESSOR D'ARCY THOMPSON.
J. E. HARTING, ESQ., *Secretary*.

MR. JOSEPH CARRUTHERS, Solicitor, Moffat, attending on behalf of the Committee appointed at the Meeting of Farmers held in Edinburgh.

Mr. Carruthers put in a holograph letter from Mr. Wilson, tenant of the farm of Water Meetings, containing a statement in regard to the plague of voles on his holding, and explained that Mr. Wilson, owing to indisposition, was unable to appear personally before the Committee to give evidence.

Mr. R. McMorran.

22 June 1892.

ROBERT MCMORRAN, Shepherd, Water Meetings, examined.

912. (*Chairman.*) You are shepherd on the farm of Water Meetings?—Yes, one of them.

913. How far is that from Moffat?—About 10 miles over the hills.

914. In the parish of Crawford?—Yes.

915. You bring a letter from Mr. Wilson, the tenant, who is unable to attend?—No; the letter was sent to Mr. Carruthers.

916. Has your ground been infested by voles?—Yes.

917. When did they appear?—In the first week of March 1891 we noticed them first. The greatest increase took place about that time.

918. Have they done much damage?—Yes, they have done great damage.

919. What sort of ground have they particularly infested?—In the bog ground they have made the most havoc.

920. Do you cut much hay?—Yes, we cut a good deal of hay.

921. How long have you been at Water Meetings?—Seven years.

922. I suppose you have always noticed a certain number of voles? Have they always been on some parts of the ground?—Yes; a few.

923. And they have greatly increased?—Oh, yes.

924. To what do you attribute that increase?—To the killing of their natural enemies, weasels, hawks, and such like.

925. Has the ground been rougher with grass than usual within the last two or three years?—Yes, it was very rough a year or two ago, but not so rough this last year.

926. There would be a great covering of grass in the autumn of 1890?—Yes, there was a good covering then.

927. And what has become of what you call the natural enemies of the voles?—They have been trapped and killed. The gamekeepers a year or two ago trapped and killed them. They took some alive and trapped others with iron traps.

928. What did they kill?—Weasels; and they shot hawks and such like.

929. When you first went to Water Meetings did you notice many weasels on the ground?—Yes, there were a good many then.

930. In the bogs mostly?—Mostly in the old dykes.

931. Is it your opinion there are not so many now?—There are decidedly less than there were.

932. Whose ground is it?—The Earl of Hopetoun's.

933. And does he reserve the shooting himself?—No, it is let.

934. What kind of hawks did the keepers kill?—They killed all sorts, little and big.

935. Are you not able to tell us one kind of hawk from another? Do you know a kestrel when you see it?—Do you mean a small hawk?

936. Well, it is not so small as the merlin. Were there any corbies in the ground?—Yes, there were, but there are not many now.

937. Do you understand by the "corbie" the raven or the hooded crow?—Well, we call them both the same.

938. But they are not the same. The raven would be twice as big as the hooded crow?—I always thought they were the same.

939. I ask about ravens because I notice in the note you gave to Mr. Carruthers you mention ravens?—Well, it is the hooded crow I mean.

940. Now when you speak of crows, do you mean the corn crow (*i.e.*, the rook) or the hooded crow?—The corn crows are doing a lot of good in the meantime. They are digging up a lot of nests of the voles and killing the young.

941. Does the corn crow (*i.e.*, the rook) breed up with you?—No.

942. Where do they have their nests?—There are no rookeries near at hand.

943. Have you taken any steps to destroy the voles? Did you do so when the increase in their numbers was first noticed?—We killed them with dogs and we killed all we could ourselves.

944. Did you try burning?—Yes, we tried burning, and it destroyed the nests and the young ones.

945. What kind of grass did you burn?—The bent. There is no heather on the farm. It is mostly all red ground.

946. Did that have any effect in destroying them. Did you see as many voles after the burning as before?—It put them off at the time but they just returned after a bit.

947. Were you short of grass this spring?—Yes, the ground was entirely wasted with the voles.

948. Did you have to take to hand-feeding?—We fed with hay and Indian corn a good deal.

949. Did you grow hay on the ground?—Yes, mostly down on the low ground of the farm.

950. What is the hay prospect for next year?—There will be none I think.

951. Owing to the voles?—Yes. Down at the farm house there may be some.

952. Of what extent is the farm?—I do not know exactly. The acreage will be about 2,500 I think.

953. What is the stock?—Ninety score and 56 in the park.

954. Have you noticed any increase in the death rate lately?—Yes, there is a large increase in the death-rate.

955. Can you give us figures?—140 on the farm this year.

956. And last year?—There were 42 last year.

957. What would be the average death rate for the last five years?—46.

958. Then as to the crop of lambs, what crop did you have this year?—About 49 score.

959. Is that an average crop?—No, it is much under the average.

960. What would be the average?—71 score and 12 for the last five years.

961. Supposing there had been no voles in the ground, would you call last spring a good spring?—Yes, we would never have had to feed had it not been for the voles.

962. It was a backward spring, was it not?—Yes, it was backward, but the ground was entirely wasted by voles.

963. (*Earl of Minto.*) You attribute the increase in the number of voles to the diminution in the number of vermin?—Yes.

964. Entirely to that cause?—I do not know. There may be other reasons, but I think the great cause is the killing of the voles' natural enemies.

965. To what cause then do you attribute the diminution in the number of vermin—to the keepers entirely?—Yes; they were always trapping them.

966. But do not the shepherds kill them too?—They may do so sometimes, but very few are killed in this way. The shepherds' dog may kill one sometimes by mistake.

967. I think you said something about weasels being taken alive?—Yes.

968. Why?—To send away to foreign countries.

969. To export?—Yes.

970. Do you know where they were sent to?—No, I do not.

971. Are they sent to Australia?—I think to Australia.

972. But you do not know exactly?—No.

973. Do you know who caught the weasels you have told us about?—The keepers.

974. By whose orders?—They would be trapped by the orders of the game tenants.

975. (*Chairman.*) We are speaking about their being caught alive?—Well, they were caught by trap.

976. (*Earl of Minto.*) You do not know for certain if these were sent to Australia?—No.

977. Do you know the numbers taken alive?—No, I do not.

978. Do you know the number killed or taken on the farm?—No, I only know that a large number was killed.

979. (*Professor D'Arcy Thompson.*) Do not you think there has been as much destruction of vermin on the low ground, where no mice have come near?—Perhaps there may be.

Mr. R. McMorran.

22 June 1892.

980. You have said that with dogs you have succeeded in destroying a lot of mice?—Yes, we killed all we could get hold of.

981. Did you work at it specially?—No, not specially, only when we were going our rounds on the hills.

982. Have you any idea of how many you killed?—I never kept any count of the numbers. We could kill a heap in a day with dogs.

983. But you never systematically pursued the plan?—No, we have plenty to do without that.

984. (*Mr. Elliot.*) Had you good weather at the lambing time?—Yes, it was dry, good weather.

985. You considered it favourable?—Yes; it was not killing weather either for the ewes or the lambs.

986. (*Mr. Gillespie.*) When the keepers ceased to kill weasels and other vermin, were they very scarce on your ground?—There is not one to be seen now, scarcely.

987. They were very much scarcer than they had been for a number of years before?—Yes, very much.

988. (*Mr. Harting.*) You have corn crows or rooks on the ground?—Yes.

989. How far would they have to come?—About six or seven miles; the nearest rookery would be over the hills.

990. Do they come in any numbers?—Not in such numbers as I have seen in former years.

991. Not so many as in former years?—No.

992. Do you know if they destroy the voles?—I know they pick out the nests, and take the young, I think.

993. Would you protect them on that account?—Yes, I think they are one of the best of birds for the destruction of voles.

994. (*Chairman.*) What kind of game is there on your farm?—Grouse and black game, but there is not much black game now.

995. In what condition is your stock now?—It is reduced to very lean condition, and is not in a thriving state. The ground is entirely riddled with the runs of the voles.

996. What is the condition of the sheep and the lambs?—I never saw the lambs so small, and the sheep I never saw in such poor condition.

997. You never saw the lambs so small, even in a hard spring?—No, I do not think so.

998. Have you any statement you wish to make on the matter other than what you have already given us?—No; I have some voles here if any one wishes to see them.

999. Are they living or dead?—Both.

1000. You have no remedy to suggest except that the natural enemies should be allowed to increase?—Yes, I think burning also is good.

1001. Have you seen any owls about?—I have seen a few, but not many, on our farm.

1002. They are not breeding there?—No, and there are not many with us.

1003. Have you any adders on your ground?—No, I never saw such a thing on the ground.

JAMES WILSON, Shepherd, Crookedstone, Crawford, examined.

Mr. J. Wilson.

1004. (*Chairman.*) You are a shepherd on the farm of Crookedstone?—Yes.

1005. Is that in Crawford parish?—Yes.

1006. Four thousand acres is about the extent, I think?—Fully that.

1007. How long have you been there?—Eleven years.

1008. Did you hear what the last witness said?—No, I was not in the room at the time.

1009-10. Well, when did you first notice an increase in the voles?—I noticed them first about the 22nd November 1890.

1011. Did you take any steps to destroy them?—No. It would not be easy to destroy them on 4,000 acres.

1012. On what land were they?—They were on the bog land last year; they are on the bents this year. The bog land is entirely destroyed.

1013. Is it the bog land you depend on for your hay?—Yes.

1014. Is there any deficiency in the crop this year?—Yes.

1015. To what extent; will there be a half crop?—I do not think there will be any hill hay at all.

Mr. J. Wilson.

22 June 1892.

1016. It would not be worth cutting, do you mean?—I think that there will be no hay at all on the hill.

1017. Have you formed any opinion as to the cause of this plague?—Yes, I think it is owing to the natural enemies of the voles being scarce, that is, to the weasels, owls, hawks, and crows being destroyed.

1018. Are there fewer of them now than there used to be?—Oh, yes; there is hardly a weasel to be seen on the place now.

1019. What is the cause of that?—They have been all killed down or caught.

1020. Who is the proprietor of the ground?—Sir Edward Colebrooke.

1021. Is the shooting in his hands?—No, it is let.

1022. Is there much game on the farm?—Yes, a good deal of black game.

1023. You say that they have been killing weasels more of late years than formerly?—Yes, they have killed the weasels down.

1024. Did they kill the hawks too?—No doubt they would kill the hawks if they could get hold of them.

1025. Every kind of hawk?—I do not know about that.

1026. Are you able to tell one kind of hawk from another?—No, I am not. They caught the weasels a number of years ago between Crookedstone and Nunnerie and sent them abroad.

1027. The keepers did?—Yes.

1028. In what year would that be?—I do not know the year or the number of years ago. A shooting tenant had the game on Nunnerie.

1029. Have they killed or taken any lately?—I do not know that, but I know that they were got along the march dyke between Crookedstone and Nunnerie.

1030. How do you know if you did not see them? Did you see them at work?—No, but I saw the boxes waiting for them.

1031. What remedy do you suggest beyond allowing the weasels and hawks to go unmolested?—I suggest that the owls should be allowed to increase. They are very plentiful just now—very much more so than we ever saw them before. Just now there are as many as 14 nests on the farm. (*See* 183, 215, 473, 1572.) One day I saw four or five mice lying about their nests, another day I saw nine young voles, and another day I saw 11 young voles. I paid particular attention to them at the time when the young owls were in the nests.

1032. But if the voles were to go, the owls would disappear, would they not?—I do not know about that.

1033. Are you aware that it is a migratory species of owl that comes to us from abroad?—No, I was not aware of that. I never saw the owls breeding on the hills until this spring. The crows harry the nests of the voles too, and they are greatly destroyed compared with what they were once.

1034. There are not so many of them now, is that what you mean?—Yes.

1035. They do not breed with you, I suppose?—No.

1036.—Now, as to the loss caused by the voles—can you give us any idea of the loss, of the effect upon the stock?—Yes, it has had a bad effect on the stock.

1037. What number of sheep have you on the farm?—I have 100 score, that is 2,000 sheep.

1038. What was the crop of lambs this year?—About a hundred short compared with the usual number, and the death rate about 50 over the whole—50 sheep, I mean; but we fed on hay in March and April, and took 10 score off the hill, and so on, to lea ground at the beginning of March.

1039. What is the condition of the ewes and lambs now?—They are very thin. I never saw them so thin.

1040. Did the keepers at Newton kill and trap weasels?—Yes, they did, 12 months ago, but they were not killing and trapping this year.

1041. Are there not weasels on the ground now?—They are but few. In fact, I have not seen a couple this spring.

1042. Do you think burning is a good remedy?—Yes, I believe in burning.

1043. Have you done much of it yourself?—The ground we burned 12 months ago is the best we have now.

1044. That is bog land, is it?—Yes, the bog land and the bent.

1045. Have you any heather on your farm?—No, no heather.

1046. (*Professor D'Arcy Thompson.*) Is this the first mice plague you have had in this part of the country?—Yes, so far as I know.

1047. You had no plague in 1876 when they had it elsewhere?—No; not on my land.

1048. (*Mr. Elliot.*) Are the voles as plentiful as ever with you?—No, not so plentiful. On certain days, however, you see more than on others. If it is dry and is going to be damp, at that time you see most.

1049. You think there are about the same numbers still?—Yes, they are very plentiful on some days, and other days, again, you do not see many.

1050. (*Chairman.*) Have you anything you wish to say further?—No, except this, that I am in favour of the preservation of the natural enemies of the voles.

1051. (*Mr. Harting.*) You have, of course, seen the weasels referred to. Is it a small animal with a short tail?—Yes.

1052. And the larger one with a long tail and a black tip to it, have you seen that also?—Yes.

1053. What do you call the latter?—The stoat weasel, we call it.

1054. You discriminate between them, do you?—Yes, of course. We know the difference between the two.

1055. And which kind was caught for export?—Both kinds. I did not see them catching the weasels myself, but I saw the boxes waiting to be sent away. A man here tells me that he was one of those who helped to catch them.

1056. Are both species of weasel generally common?—Well, they were, about 10 years ago.

1057. Both sorts?—Yes, both sorts.

Mr. C. Brydon.

CHARLES BRYDON, Coachman, resident in Moffat, examined.

1058. (*Chairman.*) You are now a coachman and reside at Moffat?—Yes.

1059. Were you formerly in Eskdalemuir?—I was seven years at Tanlawhill and Twiglees; seven years in one place and two years in the other.

1060. And did you make any observation during the time as to the destruction of the birds of prey and the weasels?—Yes.

1061. Will you state what these observations were?—I noticed that hooded crows, corbies, and weasels, were being kept down as much as possible by the gamekeepers.

1062. Were there many weasels in the district then?—Yes, there were a good many, but they tried to keep them down for the sake of the game as much as possible.

1063. Did you observe any diminution in the numbers?—I cannot say whether their numbers were reduced very much or not, but it is likely that they were.

1064. And about the hawks?—Yes, there were hawks, too.

1065. What kind of hawks?—I am not sure of the different kinds. I think one blue hawk, but I am not sure.

1066. How did the keepers kill them?—They shot them.

1067. They did not use the pole-trap?—No, but I have seen them use a trap like a rabbit trap in the stone dykes.

1068. (*Mr. Gillespie.*) How long is it since you left Eskdalemuir?—It is nine years now.

JAMES HOPE, Shepherd, Medlock, examined.

Mr. J. Hope.

22 June 1892.

1069. (*Chairman.*) You are shepherd on the farm of Medlock?—Yes.

1070. What is the extent of the farm?—About 2,000 acres.

1071. How long have you been in the district?—Two years at Whitsuntide.

1072. But you have been acquainted with the district for some time?—Yes, I have been for 15 years in the district.

1073. Do your observations on the increase in the number of voles correspond with those of the other witnesses examined?—Yes, about the 1st October last year I first began to pay attention to them. They increased a great deal after the snow in the month of March last.

1074. Have you observed any diminution in the number of birds of prey and weasels?—Yes, up till within a week ago I had only seen three weasels on the farm within the last two years, and last week I got a nest with young ones. The old one was there too. Two of the weasels I saw were stoats, the other was one of the small kind.

1075. Did you kill them?—Oh no, they were left in the nest, and I have been at it three times since I found it.

1076. Have you observed them killing voles?—Yes.

1077. Have you many rooks?—Last year there was a rookery within a plantation about 130 yards square on the farm, but the rooks were shot down to the uttermost. I know that something like 500 were killed in a day.

1078. Who was shooting them?—Sir Edward Colebrooke's keepers and one of the Earl of Home's keepers.

1079. Young or old birds?—Old and young both. They shot all they could.

1080. What did they blame the rooks for, that they shot them?—For harrying the game nests, so far as I could learn.

1081. Have you noticed anyone killing weasels?—No, they have killed none in my place; at least not since I came there.

1082. I suppose you would be in favour of preserving them?—Well, I think the rooks are doing a great deal of good this year among the voles. Though they were killed off a great deal during the spring, I think there are now a good many, hundreds more this year than there have ever been before. They drove them away from a neighbouring estate last year, and they have come to us and were breeding to a great extent last spring. They appear to be digging up the nests of the voles and killing the young ones, and partly the old ones too, I think, judging by the way they are working.

1083. Do you see any hawks about?—Yes, I have seen a considerable number of hawks this year. Last year I had a pair of blue hawks that built on the ground, and I have another pair of sparrow hawks.

1084. Was it a little hawk or a big one that nested on the ground?—It was a small blue hawk. They say they are very bad for the game, and the keepers shot them while they were sitting on the nest.

1085. Is it not the merlin you mean?—I do not know it by that name. I know the kestrel, or the red hawk. That is the one that builds in trees. I have seen them in the same plantation, but they were shot last year when they were sitting on their nests.

1086. You spoke about a small hawk breeding on the ground?—Yes.

1087. Is not that the merlin?—I cannot say for certain, we always speak of it as the "blue hawk."

1088. What is the size of it?—It is considerably less than the "red hawk," and appears to work on the small birds when hunting more than on the mice, at least that is what I have observed.

1089. (*Mr. Harting.*) How large is this blue hawk that you say builds on the ground?—Just about the same size as the cuckoo. The others are a bit bigger.

1090. (*Earl of Minto.*) Have you ever seen any weasels taken alive?—Well, before I came from the other place I was in Dumfriesshire the keepers there trapped them with box traps, and I have seen several weasels in these box traps. They were taken alive and sent abroad.

1091. Do you know where they were sent to?—No, I do not know exactly. The keeper who was trapping then was one of those on the Allowby estate. The box trap is set on the ground and baited, and when the weasel enters the lid comes down and closes it in. That is how the trap works.

1092. Do you know what the keepers got for the weasels?—No, I do not know the exact sum. I have heard it was about 2*s.* or 3*s.* a piece. I have heard that they got more for a stoat than for a small weasel. I caught a weasel once myself, and the keepers took it away, but it did not live.

1093. You are not at all certain as to the numbers that were sent away?—All I know is that five or six weasels used to be put into a box together and sent off. A box-full like that once fought and killed each other during the absence of the keepers, and after that the animals when caught were put into separate boxes.

1094. Have you any suggestions to make as to the best means to get rid of the voles?—I think preserving the natural enemies of the voles is the best thing I know of.

1095. Has any attempt been made on your ground to kill them down with men or dogs?—No, except that I myself have killed a good "wheen." I once killed on the hills 37 within three-quarters of an hour, seven of them were old ones, and the rest were young ones.

1096. Well, do you not think that if you killed so many in such a short time yourself, if there was an organised attack made on them by men and dogs a great deal might be done towards the clearing of them out?—Oh, yes; if such means were taken at the right time I believe it would be a very good thing.

1097. (*Mr. Elliot.*) Is your sheep stock much affected?—Yes, the whole stock is very much affected indeed.

1098. Affected as to the number of deaths?—Yes, the death-rate is about double what it has been for the last two years.

1099. What about your lamb crop?—We have had a fairly good crop.

1100. Have you had any sheep off the land?—Yes, we had three score of hoggs off the land.

1101. Had you to feed at all?—Yes, we had to feed one "hirsel" when there was snow on the place. The ground was very rough with the heather, and in that place the sheep were not so much affected. It is good ground, and the sheep lambed fairly well on it.

1102. (*Mr. Gillespie.*) On what part of Dumfriesshire was it that you said the weasels were caught?—I believe it was at a place called Dalvene. That is at the head of the county.

1103. Does that march with Watermeetings and Crookedstone—No, an estate comes in between.

1104. (*Mr. Harting.*) Do you consider it a mistake to allow the stoats and weasels to be caught on the ground and sent out of the country?—Yes, certainly; I consider it a great mistake when it has come to what it is.

1105. Because you consider they do so much good in killing mice, I suppose?—Yes.

1106. (*Chairman.*) When the keepers were killing the weasels, were they aware of the damage that was being done to the sheep pasture?—Well, I do not know anything about that; but the keepers, I suppose, would be killing the weasels because they had orders to do so.

1107. When representations were made to the keepers about the voles, or when you observed an increase in the voles, did they still continue or did they discontinue trapping the weasels?—They stopped trapping them then.

1108. They got a lesson, I suppose?—Yes.

1109. What stock of game is there on the ground?—There is a good stock of grouse—a very good stock, this year, apparently.

1110. There must be a good deal of heather?—Yes. There are not many rabbits on the ground, but there is a considerable lot of black game and hares.

1111. Have you noticed whether the mice ruin the heather as much as the grass?—I have noticed that they have done most havoc on the dark side of the hill.

Mr. A. Thomson.

22 June 1892.

ARCHIBALD THOMSON, Tenant on the Farm of Raecleuch, examined.

1112. (*Chairman.*) You are tenant of the farm of Raecleuch?—Yes.

1113. And you are also tenant of the farm of Little Clyde?—Yes.

1114. What is the extent of Raecleuch?—About 3,000 acres.

1115. How long have you been in the district?—I have been in it all my life. I have been in Raecleuch for 13 years past.

1116. Is the present outbreak of mice the first you remember in the district?—Yes, the first so far as I remember of any extent.

1117. You never knew anything like it before?—No, never.

1118. But you have always had some mice, have you not?—Yes, we have always had some, but not to the extent we have them now.

1119. How do you account for the present great increase?—I cannot at all account for it.

1120. Has the weather had anything to do with it?—Well, last year we had a wet summer. It may have helped to breed them a little.

1121. And the winter, what was that like?—Well, during the winter they increased very much, and also during the spring.

1122. What would you say the last two winters were—mild or stormy?—They were mild good winters.

1123. And, I suppose, the hills were pretty rough with grass?—Yes, they were pretty rough.

1124. What is Raecleuch—is it mostly grass or mostly heather?—Mostly grass.

1125. Have you tried any remedies against the voles?—None.

1126. Have you tried burning; what effect has burning?—Well, the effect of it, so far as I know, has been to send the mice into clean land. Although burning will not get rid of them entirely I think it will help.

1127. Do you reckon that you have suffered much loss on account of the voles?—Yes, a good deal.

1128. What, for instance, has been the death rate?—Well, the death rate with me has been about a half more than usual on account of the voles.

1129. And what is the condition of your stock at present?—Very poor condition indeed, and still going down.

1130. What is the present condition of the mice, are they increasing or disappearing?—They are still increasing.

1131. Are they spreading to ground where they were not before?—Yes, I have noticed that they are now on ground where there were none last spring.

1132. Do you cut much hay on your farm?—No, not much. Last season we could not cut on the hill, for the mice had destroyed it all.

1133. Do you depend much on the hay that you cut in ordinary seasons?—Oh yes. The shepherds' cows are fed on it, and the sheep are fed on it too when they require it.

1134. Did you have the usual crop of hay last year?—No, I had a very small crop indeed.

1135. What are the prospects of a crop this season?—I think on the hill ground there will be no hay at all for us to cut. It is done for already.

1136. Have you any suggestions to offer, or anything to say beyond what you have already stated?—No, I think not.

Mr. J. Patterson.

JOHN PATTERSON, Farmer, Howcleuch, examined.

1137. (*Chairman.*) You are tenant of the farm of Howcleuch?—Yes; Howcleuch is on the borders of Lanarkshire and Dumfriesshire.

1138. Is it near Raecleuch?—The farms are near each other, though they belong to different proprietors.

1139. How far does Howcleuch lie from Raecleuch?—It is nearer Glasgow.

1140. What extent is the farm?—I do not know exactly, but it is between 5,000 and 6,000 acres I should say.

1141. What stock do you keep on it?—2,200 sheep, that is 110 score.

1142. Have you suffered much damage from the voles?—Yes, very sore.

1143. Can you give us any idea to what extent?—Well, to speak about the land first, there is about 60 per cent. of the land done for.

1144. And what has been the effect upon the stock?—Oh, they were very poor indeed, and a number of them have died.

1145. Have you had a higher death rate than before?—Yes, my average death rate was three per hundred for the last five years; this year it is 10 per hundred.

1146. Ten per cent. instead of three per cent.?—Yes, that is it.

1147. What crop of lambs do you usually have. Can you give us the average?—The average crop for the last five years was 83 lambs to each 100 ewes. This year it was 50 lambs to each 100 ewes.

1148. Have you had much hand-feeding during the past winter?—Yes, during the whole winter. Unless we had hand-fed the stock they would have all died.

1149. Is that unusual with you?—Yes, very unusual to have so much hand-feeding, unless there should come a regular storm. Of course, if we have heavy storms during the winter we have to resort to hand-feeding.

1150. Did you have much snow during the winter?—Well, at times. I was pleased to see it sometimes, for the sheep ate the hay better after snow had fallen. The growing hay was all dried up by the mice.

1151. Do you cut hay?—Yes, we cut hay; partly in the bogs, partly on the hills, and partly on the meadows.

1152. Are there any mice in the meadows?—Yes, there are mice there too.

1153. Have they affected your hay crop there?—Yes, the hay crop was very much affected last year.

1154. What is your prospect this year of a hay crop?—The prospect of a hay crop on the hills is *nil*.

1155. Have you tried any remedies for the voles?—Yes, we tried men and dogs, but they were so far not very successful. One day, for instance, eight men and eight or ten dogs killed about 100. The next day we killed 200. But that is the most that we have killed in this way. Then I tried poison also, but they would not eat it. We burned a good deal of land, too, but the mice just fled to other portions of the land.

1156. Are there any birds of prey or weasels on the land?—I have seen no weasels on the land for the last two years.

1157. But before that?—Yes, there were a number before that. We have always had hawks, of course, and at the present time we have a number of owls.

1158. But what became of the weasels?—Killed out, or died. I did not see the keepers killing them myself, but I know that they did kill them. Now the weasels have left the ground entirely.

1159. Is there much game on the farm?—Yes, grouse and black game both; a good deal of both.

1160. Have you heather on the farm?—Yes, part of it is heather.

1161. Are the mice as bad on the heather as on the other land?—We could not see them to be so bad there until we burned the land. I was burning the heather a good deal with the keepers, and when the land was cleared it seemed that they were just as bad there as on other parts of the farm.

1162. You have always had hawks about?—Yes.

1163. Are they allowed to increase?—No; but they have been allowed to do so this year since we com-

plained about the mice. Before that they were trapped. We never had a real plague of mice till the back end of 1890 and the spring of 1891.

1164. You never remember anything like this plague before?—No.

1165. (*Mr. Gillespie.*) It became a plague in 1890 and 1891, you mean?—Yes.

1166. You had always mice on the farm before, had you not?—Well, we always had some, but we never paid any attention until they began to increase so much.

1167. Did you notice any increase at all in the back end of 1890?—No, we did not. The ground was very rough. Then there was an unusual growth of grass in the spring and summer of 1890, and of course they were not seen till the back end of the year to any great extent; in fact not till the grass had begun to go down.

1168. (*Professor D'Arcy Thompson.*) Do you attribute the plague chiefly to the destruction of the so-called vermin?—Well, I do not know. If the vermin had been left alone they would have helped us, no doubt.

1169. Can you tell us anything about weasels being taken alive to be sold off your farm?—No, not on my land that I am aware of.

1170. But you have heard of this being done elsewhere, have you not?—I heard of it only when I came here.

1171. Would it not be a good thing to buy some, do you think?—Well, they would be most useful, no doubt.

1172. Do you think the vermin on the hills have been kept down to a great extent on your land?—Decidedly. Corn crows (rooks), too, have been kept down. There used to be a rookery, but it was done away with about five years ago. I think these birds are grand hunters of mice.

1173. (*Mr. Elliot.*) Are the voles still as plentiful as ever with you?—Yes, in some parts where they started first; on the heavy land they are not so plentiful, but on other portions they are more plentiful.

1174. Well, do you think that the doing away with the rookery had anything to do with the increase of the voles?—Yes, I do think that.

1175. (*Mr. Harting.*) Do you think that more than one kind of field mouse does damage to the sheep pasture?—I never saw the long-tailed mouse. We have never complained of it.

1176. (*Chairman.*) Have you anything else you wish to state beyond what you have already said?—I think I have given you all the information I have unless you have any further questions to ask.

ARCHIBALD GLENDINNING, Tenant of the Farms of Nether Cassock (Eskdalemuir) and Glenderg, examined.

Mr. A Glendinning.

1177. (*Chairman.*) You are tenant of the farms of Nether Cassock and Glenderg?—Yes.

1178. What is the extent of the farms?—Altogether about 6,500 acres.

1179. Have you suffered badly from the plague of voles?—Yes.

1180. To what extent? Can you give us any idea of it?—I have got notes of it all here. For the last two years (1890–91) I have put down the loss at 1,200 lambs valued at 800*l.* and 200 sheep valued at 40*s.* each; that is 400*l.*

1181. Do you mean that your lamb crop was short during these years by 1,200?—Yes, and I attribute the shortness to the action of the mice alone.

1182. Now, to go back to the figures?—Of these 1,200 lambs, I put down 400 last year and 800 deficient this year.

1183. What is your total stock there?—My total stock is about 3,000 sheep.

1184. Then you would be about one-third short in the lamb crop this year?—Well, I should have 2,500 breeding sheep, and I have 1,500 lambs. That is a shortening of about 1,000. But I only put down 800 of these to the ravages of the mice, and 200 to other causes; for instance, one was the want of keeping parks, and there were other things also.

1185. What is the condition of the stock at the present time?—Well, I made the deterioration on 3,000 sheep last year at 2*s.* a head, and this year I make it to be more; I put it at 4*s.* a head. That brings it to 900*l.* for deterioration in the two years.

1186. Did you have any extra hand-feeding this year?—Yes, it was mostly home-feeding. Fortunately I was largely supplied with hay, not so much with hay cut last year as with old hay, and that hay I used up and supplemented it with bought hay. The value of hay and corn would be about 1,200*l.*

1187. You had a large stock of old hay?—Yes, of two- or three-year old hay.

1188. The year 1890 was a good growing year, was it not? What kind of a crop had you last year?—In 1890 the hay with us cut very badly, and last year we had still less. In fact we had two bad hay years, for although we had a good crop of grass in 1890, we did not have good weather to make hay in.

1189. Have the mice done much damage on the hay ground?—Yes, they have used it up completely. They attacked the bog land first, and when they had done with that they went to the low ground next. Then they appeared on the bent and on the heather. As the finer grasses get used up they attack the coarser kinds.

1190. What is the hay prospect this year?—Well, we will have to take as much hay off the meadows as possible, believing that there will be no hay on the hill at all.

1191. I suppose there has been a considerable improvement during the last three weeks in regard to the hay?—Yes, a good deal of improvement within the last three weeks. We had no grass at all about a month ago. Until the rain came I never saw the grass so bare.

1192. Have you tried any remedies against the mice?—Well, the best remedy I have tried is mowing the ground. It leaves the roots of the grass strong for next year.

1193. Does burning act in the same way?—We burn the old turf, and then the mice as a rule do not work on the roots in the same way. It is the same with ground that has been mowed, and that is the reason why I go in for mowing.

1194. (*Earl of Minto.*) Is your farm in Eskdalemuir?—Yes.

1195. Is that near Mr. Scott's farm?—There is only one intervening between our farms, and we happen to be nearly in the centre of the mice-breeding district.

1196. Have you anything else to say as to remedies?—I think (as I have said) that burning and mowing the grass are very good. Owls are very useful too, and they can work easier on the mice when the grass has been mowed, and does not cover the nests. When they are thus exposed to view, the birds can see them more easily. It would keep the mice down a good deal if their natural enemies, the owls and the hawks, were preserved.

1197. But is it not possible for the farmers to assist the natural enemies of the mice in the way Mr. Scott has done?—I cannot say.

1198. (*Professor D'Arcy Thompson.*) Had you any experience of the previous plague?—Yes, this is the third I have experienced.

1199. In which years were these?—In 1875–76; that plague terminated at the end of April 1876—the last three days of April, if I remember rightly—by a snow storm followed by sleet and frost.

1200. And the second plague you referred to?—The next was four years ago, in 1888, but it was not so severe, though it crippled me very much in the cutting of hay. The men had to cease mowing before the end of the usual hay season simply because the ground had been ravaged by the mice.

1201. And on the former occasions referred to did you take any means to arrest the destruction?—No, we took none.

1202. The mice just disappeared by themselves then?—Yes, they just disappeared as they came owing to climatic influences I suppose.

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1203. Were there similar climatic influences in 1888?—Yes, I believe there were. There must have been; although I cannot fix the date at which they disappeared. But the next year we had a fair crop of hay; that was in 1889-90. There would be a remnant of mice left, and these very likely would be the originators of the present plague. But the bulk of them were done for in the winter of 1888-89.

1204. Was there any assemblage of owls such as we have now?—The owls, hawks, and weasels have diminished up to a year ago, but when the plague of mice came they were protected by the proprietors and everyone interested in agriculture. There was a great diminution of their numbers up till a year ago I should say.

1205. I suppose there is no doubt at all that these so-called vermin are a very good partial cure for such a plague?—Yes; I think the best we have.

1206. But do you say that their destruction was the cause of it?—Yes; aided by climatic influences. The mild temperature would promote the growth of grass and bring about an extra roughness of the ground. These two causes, in my opinion, account for the plague.

1207. Is it not the fact that sparrows and other small birds have also increased in numbers owing to the destruction of the so-called "vermin"; and do not they do harm like the mice?—I do not know anything about that; I have not paid any attention to it.

1208. (*Mr. Elliot.*) Is the game let upon your farms?—Yes; it is let upon both farms.

1209. Who is the tenant?—Mr. Stone, of the Greenwich Observatory, has Over Cassock, and Mr. Massey had the Duke's portion, but it has been recently in the hands of a Captain somebody.

1210. Do the keepers destroy the weasels and hawks?—I believe they have destroyed them ever since my infancy up till last year. Up to that time a regular destruction of them took place, but since last year proprietors have been more considerate in preventing their destruction.

1211. Do you think that the natural enemies of the mice would have increased except for that?—Undoubtedly.

1212. And would they have kept the mice down do you think?—They would have had a very good chance at all events, because if they had been left alone there would have been a great deal more of them. At the present moment there is perhaps not more than one weasel on my farm. I have seen only one on the ground since last summer, and that was the last one I saw.

1213. Were they plentiful at one time?—Yes, they were plentiful eno', but there has always been a destruction of them since I can remember, and especially of late years.

1214. What was the condition of your sheep at Whitsuntide?—At Whitsuntide last they would be at least 4*s.* per head less in value than they would have been had there been no mice. That is what I reckon.

1215. But over the whole extent of time the plague has lasted with you?—Well, the year before I estimate that there would be 2*s.* a head deficiency in the value. That is my opinion, and I have ascertained it as carefully as possible.

1216. (*Mr. Gillespie.*) Was the plague of voles in 1875-76 as widespread and as severe as at the present time?—No; not so widespread nor so severe. They were only found in the upper part of the parish in the Ettrick and Borthwickhead districts.

1217. And they were nothing like so numerous at that time?—No, they were not. At present they are remarkably so. They were bad before, but this time they are something extraordinary.

1218. What about the plague of 1888—how did it appear, relatively, in extent?—It fell far short of the present one. It was comparatively a mild plague; the most injury it did was in preventing our getting a sufficient amount of hay cut. Of course we have had a roughness of grass of late years, and we did not find the full effect of it until afterwards, for the winters were mild.

1219. Are you aware that certain small birds, sparrows for instance, are more plentiful now than they were a few years ago?—Yes; I have found that to be the case at Eskdalemuir.

1220. (*Mr. Harting.*) Can you tell us whether those plagues were sudden in their commencement, or whether they came on gradually?—In 1875 and 1876 they began in small numbers; and for a year or two before that the climatic conditions had been favourable to their increase, especially in 1875, and the back end of 1876, when, as I have stated, they were destroyed by the tempests which we had during the winter.

1221. It was stated in other parts of the country—I am speaking now of the plague of 1875-76—that the mice appeared on the lower land first, and worked their way up to the higher ground. Was that the case on your ground?—Well, I do not remember that. I do not know what ground was attacked first; but that may have been the case for all I know. That was certainly the case this time.

1222. You have not told us what proportion of your acreage has been affected by the mice?—Well, setting aside 500 acres for rock and other land that has no stock-keeping capabilities, there would be an acreage of 6,000 acres infested by the mice. Last year they used up the low ground completely, and the bogs too. This year they have gone to the rougher ground. They have gone higher up on the bogs and hills. The lower ground which was injured last year is picking up a bit, but the other ground is a complete "waster."

1223. So that nearly the whole of your farm has been affected?—Yes, nearly the whole of it, because it is mostly rough ground.

1224. (*Chairman.*) You have spoken of burning as a useful remedy; is there no limit to which you can burn your ground, that is, supposing you burn it and leave no roughness, how would the sheep get on during the winter?—We cannot burn it all, of course. We always leave a part. There should be in ordinary years a good part left unburned. But last spring there was more burned than usual, for the very good reason that it took the roughness away and exposed the mice to their natural enemies.

1225. Even if there is no doubt about the efficacy of burning is there not also an advantage every winter in leaving a part of the ground rough?—Yes, a very great advantage, indeed.

1226. You have snow sometimes, I suppose?—Yes, and on that account we always leave part of the ground rough. Burning should only be done on a reasonable portion of the farm, and there should be burning periodically.

1227. Is there anything else that you wish to state?—No, I think not. I think I have made it plain that I attribute the increase of the voles to the destruction of their natural enemies, aided by the mildness of the seasons which have preceded this.

1228. (*Mr. Elliot.*) You would, I suppose, approve of the burning of good bogland on the farm periodically?—Well, I should not approve of burning periodically unless it was very much withered by the ravages of the mice.

1229. But supposing there were no voles, would you approve of burning part of the bog land?—No, I would prefer in this case to make it into hay. It is possible, however, that the season might be so very bad that the hay could not be cut, and then I would rather burn it than allow it to remain in a wild state. I would only approve of burning the bog land in a case like that, supposing we had no voles.

Mr. C. Scott.

CHARLES SCOTT, Breconside, Moffat, examined.

1230. (*Chairman.*) You are now tenant of the farm of Breconside, but you formerly lived, I understand, at Waterhead, Dryfe, and at Eskdalemuir?—Yes.

1231. Do you know that the keepers have destroyed birds of prey and weasels?—I have seen them nailed up to the kennels as I came along—weasels and hawks and hooded crows, too.

1232. You cannot tell us what kind of hawks?—Yes, they were kestrels and sparrow hawks.

1233. How were they destroyed?—By shooting and trapping on the ground.

1234. Did you ever see a hawk in a trap?—Yes, about 15 months ago I saw one in a pole-trap.

1235. What kind of hawk was it?—It was one of the big kind. It was not a horned owl, I know that.

1236. That was 15 months ago?—Yes.

1237. But you were not at that time resident at Eskdalemuir?—No, it was at Waterhead I saw it. The voles were doing much damage before I left at Whitsuntide, and the men on the farm of Waterhead told me that four sheep had been caught in traps that had been set on the ground.

1238. But can you tell us a little more about the hawks. Do you know a sparrow hawk, for instance?—Yes, I know a sparrow hawk and a kestrel hawk when I see them.

1239. Do you know that the sparrow hawk frequents plantations?—Well, I don't know that; they were in the woods at Eskdalemuir.

1240. From what you know of the habits of the sparrow hawk, would you expect to find them there?—I do not know much about them, because there were not many sparrow hawks at Eskdalemuir. They were mostly kestrel hawks there. Both kinds, I know, have been trapped.

1241. Have you formed any idea of the relative destructiveness of hawks to game?—No, I have not.

1242. You were not expressing any opinion then, as to the justification which the keepers might have in killing them?—No, I do not say anything about that.

1243. Do you know anything of the habits of birds of prey in connexion with voles; have you ever seen them killing voles?—I have heard of their killing them.

1244. Would you wish to see them protected?—Certainly, I should wish to see them protected.

1245. And would you say the same of the carrion crows and rooks?—Yes, I should say both should be protected in view of this plague of mice.

1246. Do you think that the destruction of them has had much to do with the spread of the plague?—Well, I should say it has helped it to a great extent.

Mr. C. Scott.

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JOHN MORTON, Nether Abington and Elvanfoot, examined.

Mr. J. Morton.

1247. (*Chairman.*) You are tenant of the farm of Nether Abington. What is its extent?—It is about 700 acres.

1248. Any hill land?—Yes, I am also tenant of the farm of Elvanfoot.

1249. That is a larger farm, is it not?—Yes.

1250. How long have you known this district?—I have been 30 years in the district, and have been tenant for over 20 years of these two farms.

1251. Have you got any voles on your land?—Yes.

1252. Have you formed any idea as to the cause of their increase?—I cannot attribute it to anything except the killing of the natural enemies of the voles, which has been going on for a number of years past. Sixteen years ago I could not have gone round my place without seeing one or two weasels. Now I rarely see one.

1253. Have they been all killed by the keepers?—Yes.

1254. Is there much game on your land?—Yes, black game, pheasants, and grouse.

1255. But I suppose you would have no objection to the destruction of weasels till you saw the mice?—No. Still we are always glad to see a weasel about the farmhouse. I insisted upon the keepers protecting them near the buildings, because they killed the rats about the stack yards.

1256. Is that the little or the big weasel you speak of?—It was the little weasel. There are very few stoat weasels about us.

1257. Do you suffer much from the attacks of the voles on your land?—Yes, a good deal.

1258. Has the stock suffered much in quantity and in quality?—Yes, a good deal by death, and there has been a short crop of lambs. I had to resort to hand-feeding for a number of weeks.

1259. Do you advocate importing weasels?—Yes, I think that is one of the best things we could do. I would willingly pay my share of the expense of importing them if they could be got anywhere. I have not seen a weasel on my farm for some time. On the neighbouring farm to mine I know that about half a bushel of voles were found lying dead round about the hole of a weasel's nest.

1260. (*Mr. Elliot.*) Are the voles as plentiful with you as ever, or are they decreasing?—I think they are increasing still.

1261. (*Mr. Gillespie.*) Have you noticed whether the young trees have in any case been injured by the voles?—Yes, I have noticed that. There is a plantation quite near to me at Abington, and there the voles are killing the young trees. One tree I believe has been killed altogether, and others have been much injured, and are fast dying. The plantation is just swarming with mice.

1262. Is there any difference between the mice in the plantation and the mice you have on your farm at Elvanfoot?—I have seen no difference, so far as I have examined them.

1263. (*Mr. Harting.*) Will you describe how the trees have been injured; are they injured at any height from the ground, that is what I want to know?—Two or three inches only above the ground, and at the roots likewise.

1264. Would you say that they were not injured at a greater height, for if not, it would tend to show that these voles do not climb?—Well, from what I have observed, I do not think that they can climb, nor injure the trees at a greater height. I have certainly not seen them climbing, nor have I seen trees injured in any other way than what I have described.

1265. (*Chairman.*) Do you advocate any other remedy besides importing weasels?—Oh, yes. Burning, I think, is very successful, on heather land especially.

1266. But does it destroy the voles, or does it merely drive them off to other ground, as we have been told?—On very old heather after burning it we found some dead voles. That was heather of eight years' growth.

1267. Do you say it is in the old heather that voles are mostly found?—Well, my experience is that they rarely do any damage to the young heather, and that heather which is of six or eight years' growth is most infested by them.

1268. That is the experience on your farm?—Well, I think that is the general experience. I have found it to be the case on my own farm.

WILLIAM GRAY STEWART, tenant of the farm of Middlegill, Moffat, examined.

Mr. W. G. Stewart.

1269. (*Chairman.*) Are you the tenant of the farm of Middlegill, near Moffat?—I am partner with my father there.

1270. What is the extent of the farm?—About 3,000 acres, or between 2,000 and 3,000.

1271. Have you suffered very much from the voles?—Very much indeed.

1272. When did they first appear, at the same time as in other places?—The first I saw of them was in the summer of 1890, but a marked increase was perceptible in the month of July last.

1273. Have you tried any remedies?—Yes, by killing them with men and dogs, and by poison also.

1274. What kind of poison did you use?—Poisoned grain.

1275. How did you apply it?—I put it in the holes in the meadow land.

1276. But to apply poisoned grain over 3,000 acres is a large order, is it not?—I did not use it over the whole farm, of course. It was only over a meadow of ten acres that I tried it.

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1277. Well, did you succeed in exterminating the voles there?—Partly so, but not altogether.

1278. Are they diminishing now over the hill grounds?—No, they are increasing still.

1279. Would you think it practicable to try poison over a great extent of country?—No, I do not think so.

1280. Only on an enclosed piece of land you think?—Yes, it was on a piece of meadow land I tried it.

1281.—What has been the effect of the voles' depredations on your stock?—Very detrimental indeed.

1282. How has it affected the stock; has it increased the death-rate?—Yes, very much. The death-rate has been fully doubled.

1283. You speak roughly, I presume, can you not give us some statistics?—Well, we have a death-rate now of fully double the average of the last five years.

1284. And what is the condition of your stock at present?—Very poor indeed. The sheep left are very thin, and we shall lose a great many more.

1285. Are there any other remedies which you would wish to see applied besides poison and the use of dogs?—I should say, that preserving the natural enemies, and perhaps burning more than has been already done, might be beneficial. Of course, this year we have burned a great deal on our farms.

1286. (*Earl of Minto.*) Do you attribute the increase of voles to the diminution of vermin?—I should say partly; indeed, I should say a good deal.

1287. And to what other cause would you attribute it?—To the rough state of the ground also, I should say.

1288. (*Professor D'Arcy Thompson.*) Is there anything very unusual in your ground being so rough as it has been during the last two or three years?—Well, it was unusually rough.

1289. When you tried killing the mice by men and dogs, what sort of progress did you make?—Well, for instance, about a fortnight ago, one of the shepherds and myself took a dog with us, and within an hour we killed 69 voles, old and young together.

1290. Are owls being attracted to your place now?—Yes, we have a number of them.

1291. And yet, as you say, the mice are making headway?—Yes, they are still making headway.

1292. (*Mr Elliot.*) You say burning would be only a partial remedy in you estimation. Is your land grass, or heather?—It is grass land.

1293. Why then, do you not burn?—I said that we had burned a great deal this year.

1294. But previously, I mean?—Previously we did not require to burn, we just burned by rotation in the ordinary way. What we burned one year, we of course did not burn the next year.

1295. Do you think it would be an advantage to burn the grass land periodically?—Yes, to burn the bent land periodically.

1296. (*Mr. Gillespie.*) Have you formed any estimate of the proportion of the land that so far as keep is concerned, has been seriously injured, if not entirely destroyed by the action of the voles?—Up to a month ago I calculated that the per-centage of wasted land would be about 60, that is to say 60 per cent. of it had been destroyed by the action of the voles.

1297. Were vermin very scarce with you?—Yes, till this year they were very scarce.

1298. You had scarcely any weasels had you?—I think I have only seen one weasel for a year past on our land.

1299. That is fewer, I suppose, than you noticed some years ago?—Certainly it is.

1300. So there has been a killing down of vermin here?—Yes.

1301. (*Mr. Harting.*) Will you give us a little more information about the experiment of poisoning that you tried. I should like to know if you have with you any samples of the poison that was used?—I have got with me some stomachs of the voles that were poisoned with it; but perhaps you would not be able to see from them what the poison is, because they are very much decomposed.

1302. Well, but have you any sample of the poisoned grain with you?—Yes (*produced*).

1303. Do you know what poison this grain has been steeped in?—I only know that it is the German poisoned grain.

1304. But you do not know what the poison is?—No, I do not know that.

1305. For the information of the Committee, I may state that I recognise this poisoned grain as similar to that which was sent to me, and which I had analysed. The poison used is strychnine, and the peculiar pink colour which the grain has is due to its having been steeped in aniline dye for the purpose of distinguishing it from other grain, and preventing the risk of its being used for any other purpose than that for which it is intended. (*To witness*) May I ask how you proceeded to apply the grain?—I used it on about ten acres.

1306. But how did you use it?—I put it into the holes of the voles.

1307. Did you leave any of it on the surface?—A very little. I left one or two grains on the strong runs.

1308. How much would you say you put on the ten acres?—I do not know, but I went over it twice.

1309. Did you give it a pretty liberal dose?—Well, I used about a couple of quart bottles of the grain.

1310. I understand you put upon the ten acres as much as could be contained in two quart bottles, and you applied it by putting a very few grains into each hole, is that so?—Yes.

1311. Did you notice, as a result of your experiment, that when you afterwards looked at the ground you found a good many dead voles lying about?—Yes, I saw a good number, and we found them dead in the holes too. The meadow where we used it was very much over-run with both voles and water-rats.

1312. I am anxious to know if you found any other animals dead besides voles?—No, I did not notice any other animals.

1313. Then you would not say that in using the poison there was any risk of killing the natural enemies of the voles?—That is a question I can hardly answer. I can only say that I found nothing dead but the voles. I should like to see Professor Loeffler's experiment tried.

1314. You know the nature of it, I suppose?—I understand that it implies inoculation of the voles, and that that inoculation is supposed to spread a contagious disease which would exterminate the others. I should certainly like to see it tried over a limited area.

1315. Do you mean in the same way as you have made this experiment with the poisoned grain?—Yes.

1316. You know of no such experiment having been made hereabouts?—None, except with the grain, and I have not heard the results of other experiments that may have been made in the neighbourhood.

1317. Do you know that Major Craigie, of the Board of Agriculture, paid a visit to the district some months ago?—Yes, I know that he did so, and he reported upon what he then saw.

1318. Do you know what the report was?—I read it.

1319. Have you any reason to suppose there is any material alteration at the present time from what Major Craigie in that report describes?—No, I have observed none.

1320. Do you think that it is pretty much the same now as it was when Major Craigie's inspection was made?—Yes, except this, that there are more voles now—I mean more young ones.

1321. But that would be in consequence of the intervention of the breeding season, I suppose?—Yes, I suppose so.

Mr. M. Johnstone.

MICHAEL JOHNSTONE, on behalf of Mr. Walter Johnstone, Alton, Moffat, examined.

1322. (*Chairman.*) You manage the farm of Harthope for your uncle, Mr. Walter Johnstone?—Yes, I do.

1323. And your uncle is unable to attend here to-day owing to bad health?—Yes.

1324. How long have you been at Harthope?—All my days—that is since I was able to manage a farm.

1325. Has your ground been much affected by voles?—Yes, very much since 1891.

1326. What have you been doing to meet their attack?—Nothing further than killing with dogs and sticks when we had an opportunity.

1327. Have you not tried burning?—Yes.

1328. With what success?—Great success. It has, I think, been effectual.

1329. It has been effectual, in what way?—In this way, that it drove the mice off to other ground, but I do not think it killed any mice at all.

1330. That is not very pleasant for your neighbours, is it?—Well, it is a case of everyone for himself.

1331. Has your stock suffered much from the destruction of the grass by voles?—Yes, from the want of grass. I should say that I had 200 sheep off the ground for two months during the season, and that the lamb crop this year is 180 less than last year and 300 less than the year before that.

1332. I should have asked you first, what extent is Harthope?—About 2,000 acres.

1333. And what stock of sheep do you have?—750 lambing ewes.

1334. Can you tell us the average lamb crop for some years?—Yes, our average has been 450. The highest was 713, the lowest 322—that is this year.

1335. Do I understand that the general condition of your stock is low at this time?—Yes.

1336. And you attribute it entirely to the action of the voles?—Certainly; I see nothing else to account for it.

1337. Was this a favourable season for the sheep, apart from the ravages of the voles?—Yes, if the voles had kept away this was a good year for sheep, and they would have lambed well.

1338. Do you share what seems to be a general opinion that the sudden increase of the voles is due to the destruction of their natural enemies?—Undoubtedly I think so. The gamekeepers have killed off the weasels to such an extent that I never see one now.

1339. But was the increase of the voles not assisted by any peculiarity of the seasons?—Well, 1890 was a splendid season for grass. There was a very rough growth of grass, and that tended to the increase of the voles.

1340. You think there are fewer weasels than formerly?—I think so; I never see one now, and I used to see plenty before.

1341. Have they been destroyed this year just as they used to be? Have you seen men killing them?—Yes, I have.

1342. And you are of opinion that they ought to be left alone?—Yes.

1343. Do the owls come to your ground at all?—Well, we have not many owls. We have more hawks than owls.

1344. What kind of hawks do you have?—We have the small blue hawk principally, the red one occasionally; but there are few red ones just now.

1345. By the "blue hawk" do you mean the merlin?—No, the small sparrow-hawk I mean.

1346. Do you think they kill mice?—Yes, I think all varieties of hawks kill mice.

1347. Have you ever seen a sparrow-hawk kill mice?—No, I cannot say that I have seen it.

1348. Do you know that, being a woodland bird, it is not a common thing to see a sparrow-hawk on the moor?—No, not a very common thing.

1349. It is important that we should get all the information we can about the different species. You know, I suppose, that it is stated that the sparrow-hawk does not readily take the mice. Have you any experience to the contrary?—No, I have not myself seen them do so, but I am told they kill them.

1350. Are they protected now?—Well, the gamekeepers have not killed any during the last year.

1351. (*Mr. Gillespie.*) Have you any personal knowledge of a wood on your father's property being destroyed by voles, the plantation at Snar, I mean?—Yes, I believe a young plantation there has been entirely destroyed by the mice.

1352. So much so that your father has had it burned?—Yes.

1353. But you have not seen it yourself?—No.

1354. Do you know what the extent of the wood is?—I do not know.

1355. Is it not between three and four acres?—Yes, I think it is.

1356. (*Mr. Elliot.*) What extra expense were you at in keeping your sheep this winter in comparison with ordinary years?—Keeping the sheep off the ground cost about 70*l.*, and 50 of them did not come home at all. They were lambed away from home. When the sheep were eating at home, of course they were no expense, because they were simply eating the hay, which was not bought here.

JOHN WAUGH, Tenant of Granton Farm, Moffat, examined.

Mr. J. Waugh.

1357. (*Chairman.*) You are tenant of Granton Farm?—Yes.

1358. Have you made experiments with poison?—I have tried two kinds of poison.

1359. And what has been the result?—In one case the result was a failure. In the second experiment it proved effective.

1360. What kind of land did you try it on?—Particularly upon bog land and in the fields.

1361. I should have asked you what is the extent of your holding?—About 1,500 acres.

1362. You say that the first experiment was a failure, in what respect did it differ from the second? Was it the same poison?—No, they were different poisons. The first was lard and phosphorus, and something else added in order to make it attractive to the voles, but they would not eat this mixture.

1363. Then what was the second attempt?—It was made with the grain just shown to the Committee—I mean the German poisoned grain.

1364. How did you apply it?—I marked the holes very carefully and took their numbers, and I applied the grain by inserting it into the holes, putting it in with a long spoon. I laid down the poison at 8 o'clock in the evening, and revisited the place next morning at 8, when I found several dead voles around the holes. I examined other holes carefully, and found that the mice had been trying to push the grains to the open, and that they had stuck. I repeated the experiment in several cases with the same result. I always put it in at 8 o'clock in the evening and returned next day.

1365. Why did you always choose that time?—In the first place as being convenient to myself, and in the second place because I thought they fed about that time of the evening.

1366. And the course proved unfortunate to the mice?—Yes, it did.

1367. Is it not the case that the short-tailed vole works by day rather than by night?—My experience is that they feed to a greater extent in the evening. But they do feed, I know, at most times during the day too.

1368. Did they run at night?—Yes, they seemed to leave their holes in the evening. I gave them the poison most effectively in the evening, about sunset.

1369. What extent of ground did you try it upon?—About 100 acres, more or less, selecting, of course, the most likely ground so as to give it a fair trial.

1370. But it would be a serious operation to carry it over 1,500 acres, would it not?—It could not be done; at least it could only be attempted as a last resource.

1371. Have you observed the crows or any other birds or mammals feeding upon the bodies of the mice that were poisoned?—No, but I have seen them destroying young ones.

1372. Do you think there is a risk of destroying the natural enemies of the mice by applying poison?—Yes, certainly, and that is why I say it should only be resorted to in an extreme case. I think the use of poisoned grain would be dangerous, not only to some of the natural enemies of the voles, but possibly also to grouse and other game. It might perhaps clear the hills of game.

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1373. Do you think it would be a useful thing in an enclosed space, such as a field?—Yes, I should have no hesitation in applying this remedy in the case of arable land.

1374. (*Mr. Harting.*) I presume that in all cases you put the grain into the holes or runs, and left none on the surface?—Yes; but I found that after I had put it into the holes the mice carried it to the surface, and fed upon it outside.

1375. And there they died?—I do not know that, but they carried it out, and that, I think, would make it dangerous to use it in the manner which has been suggested.

Professor McFadyan.

Professor McFadyan, Royal Veterinary College, Edinburgh, examined.

1376. (*Chairman.*) You are lecturer, I believe, in pathology in the Royal Veterinary College, Edinburgh?—Yes.

1377. I think you have studied experimentally the German system of inoculation?—No, but I have made myself familiar with Professor Loeffler's paper on the subject—I mean his original paper on the organism by which he proposes to combat plagues of field mice. I have not had any opportunity myself of making experiments in regard to his method, for, so far as I know, the culture remains solely in his possession.

1378. Then what are the experiments you are reported to have made with house-mice?—Experiments which I suggested to a local committee which was formed in this neighbourhood some time ago. I thought that an organism in my possession might possibly act on the voles in the same way as that discovered by Professor Loeffler, this organism of which I speak having proved fatal to house-mice by inoculation.

1379. Is that method of yours also a secret?—No, not at all.

1380. There is no copyright in "bacillus"?—No, I do not think so. In saying that Professor Loeffler's method is at present a secret, I do not mean that he is not ready to give the culture to any bacteriologist applying for it, but I have refrained from asking him because I thought perhaps your Committee might ask for it, and would be more likely to obtain it. But the organism which I had in my possession, and which is fatal to house-mice by inoculation, appeared to be non-infective by feeding, and that is an indispensable qualification, of course, in any organism to be used to combat a plague in the fields.

1381. Does it affect only the individual mouse inoculated, or can it be communicated to others?—Mine is non-communicable except by individual inoculation.

1382. And is that not the case with Professor Loeffler's also?—No; it is remarkably fatal by feeding.

1383. Yes, but what I mean is that each mouse has to partake of it before it becomes affected? In other words each mouse has to feed?—Each mouse has, of course, to have introduced into its system this particular organism, but this it appears can be introduced by what may be described as natural methods. Professor Loeffler found that an outbreak, as we may term it, occurred in the cage in his laboratory by accident, and nearly 70 per cent of the mice died of the plague much against his wish. On investigation he found that their death was due to this particular organism. These, of course, were house-mice. But he afterwards experimented with field-mice inasmuch as there was a kind of a plague in the neighbourhood of Greifswald, and he found that the organism was rather more fatal to field-mice than it was to house-mice.

1384. Can you describe to us the method?—Yes. The organism, which is the cause of this disease, is one very easily cultivated. Had it been otherwise it would not, of course, have been suitable, as a matter of fact use may be made of a great many materials which are readily prepared in the laboratory. To poison the mice Professor Loeffler found that it was only necessary to soil with the material upon which this organism has grown either grass or anything that mice would eat, such as fruits or roots. He found by putting this in their cages he could kill them with certainty. He ascribed the fatality in a whole cageful of mice partly to the fact that when one mouse died the others devoured it or part of it. He calculated, I think, that this fact would come into play also in combating plagues of field-mice; it would not be necessary for every mouse to eat part of the poisoned bait, but that a good many might be poisoned indirectly through eating their own companions which had been previously poisoned.

1385. But at present we have no evidence that these voles eat their dead companions?—Well, there is evidence at any rate that they do it in cages very frequently. I am not prepared to say that they do so in a state of nature, but I can, from my own experience, say that many small rodents do eat their dead companions in confinement, although not always. Perhaps I may add that Professor Loeffler does not hold that it is absolutely necessary that they should eat one another in order that his method should be efficacious. He was not sure that the organism might not be transferred from one to another by inhalation, or that the germs might not be passed in the fæces of one animal and in that way contaminate the food of others.

1386. But is it not a peculiarity of the voles that they are particularly cleanly in their habits?—I cannot speak as to that.

1387. Supposing it was so, that would put the Professor out of court in one respect; but perhaps you will proceed with your description of Professor Loeffler's method?—The culture of an organism may be prepared in such a way that it will not alter the taste of anything into which it has been introduced. That being so, the food infected would be more likely to be eaten than any treated with a mineral or other poison. A very small quantity would be quite sufficient to set up a deadly complaint, and the organisms are not discoverable except with the microscope. Then again, a very important point in connexion with the proposed use of such an organism would be to ascertain that it is not fatal to other animals. Professor Loeffler had partially ascertained this at the time his first paper on the subject was published.

1388. (*Professor D'Arcy Thompson.*) We are told it would be impracticable to distribute poisoned grain over very large areas; would it not be still more impracticable to prepare and distribute the food saturated with bacillus over these areas?—I think (if I have formed a correct estimate of the extent of ground affected) it would be a very difficult matter to prepare a sufficient amount of virus to be used in this way, on the supposition that every mouse would have to eat part of the infected food before it would be affected. But it is not, so far as I know, disproved. I cannot say it is proved that the disease once started would spread among the voles to a certain extent.

1389. (*Chairman.*) By what means?—In the same way as pleuro-pneumonia or rinderpest spreads among cattle.

1390. By contagion?—Yes, or infection; in the same way as swine-fever spreads, or any of these diseases.

1391. (*Professor D'Arcy Thompson.*) Does it not strike you, after studying reports which have appeared, that a peculiarity of this germ is that it is not communicable or at least that we have no evidence to show that it is?—I do not know that there is any evidence that it has been used successfully on a large scale. All I can say is that on the scales on which it was tried at the time Professor Loeffler's paper was published, it worked admirably, and that it was only necessary to introduce a little of the culture into a cage containing a large number of field-mice in order to bring about the death of the whole lot.

1392. Is it not the fact that Dr. Loeffler especially pointed out that under those circumstances the survivors ate the bodies of their dead companions, and that the conditions were therefore different. He does not insist upon that, but he also says that he had not really made experiments to prove—and that he was not satisfied—whether infection might not take place in the other ways I have mentioned, namely, by inhalation or by the injection of germs voided by other animals.

1393. (*Chairman.*) Have you the paper here in which that is so stated, or is it mere hypothesis?—Yes, I think he says distinctly that he has not made any experiments in that way.

1394. (*Professor D'Arcy Thompson.*) Many creatures he proves to be unsusceptible to this virus. Are you

aware that there were any game-birds among the number?—Professor Loeffler found that fowls and, I think, pigeons could be fed upon food into which the culture had been introduced, without fatal result. But I have the exact sentence here. He says: "Pigeons and fowls were fed with this culture for a "long time without result, as were also pigs and "rabbits."

1395. Can you direct us to any special report by Dr. Loeffler upon his experiments in Thessaly?—No, I cannot. (*See* Appendix No. VI.)

1396. (*Mr. Gillespie.*) Do you think from the perusal of Professor Loeffler's experiments that *primâ facie* there is a reasonable hope of success, if an experiment were made, a sufficient quantity of the virus being procured for the purpose, and having regard to its applicability under the circumstances now existing in the country?—Yes, I think that would be advisable, for it has not been proved inefficacious.

1397. Do you think it would be well to make application for material for a trial?—Yes, I think so.

1398. (*Mr. Harting.*) From the reports which have appeared in different journals there seems to be a little difference of opinion as to the precise method suggested by Professor Loeffler, that is to say, whether the germ is introduced by inoculation or whether it is communicated by means of food. I do not know if you have read an article in the *Journal D'Agriculture Pratique*, of the 19th May last, written by Dr. Gennadius, the Minister of Agriculture for the Interior, Greece. In the article he purports to give an account of Professor Loeffler's method, and he describes it. He says that an infusion of straw (*paille*) is made, into which is put a little sugar, salt, and soda. In this solution the gelatine is dissolved which contains the cultivated germ, and the bread or other material soaked in this solution is put into the runs and holes of mice. Now, the point I wish to make is that this is a distinct statement by Dr. Gennadius that the germ is introduced by the alimentary canal, and not by injection as some have asserted. What is your opinion?—I think it is quite erroneous to say that Professor Loeffler ever suggested inoculation or injection. His original paper I have here in a German periodical devoted to bacteriology (*see* Appendix No. VI.). It contains a statement of Dr. Loeffler's method, and it agrees with that which you have just given. He proposes to cultivate the organism on a laboratory scale, to cultivate it in gelatine, and he finds that it grows very well in a sterilised potato. He finds also that it is only necessary to give portions of the potato upon which the organism is growing to a scarcely visible extent in order to poison all the mice that take it. He also suggests that the gelatine may be sprinkled over bread which may be given to the mice, with the same result. There is no mention of inoculation, which, of course, would be a difficult question. (The witness is mistaken. *See* Appendix VI.)

1399. I understand that Dr. Gennadius in the article referred to, states that the results of experiments in Thessaly were not very different from those made in Dr. Loeffler's laboratory, namely that only those mice were affected which had partaken of bread saturated with the preparation—that these alone died, and did not communicate any infectious disease to their neighbours?—In that case the method would lose one of its two advantages, but it would still have one advantage The laying down of ordinary vegetable or mineral poisons opens up a distinct risk of poisoning other animals, such as hawks, owls, and rabbits; whereas it is claimed for this method of Professor Lœffler that it is perfectly harmless to animals other than the house and field mouse. The same cannot be said of arsenic or other poisons which would be fatal to all these animals.

1400. Would you, from your researches on the subject, recommend that an experiment of this nature should be tried over a limited area for the purpose of ascertaining the result, or do you think from what has been done already by Professor Loeffler himself, or through his agency, in Thessaly, that the result is not sufficiently satisfactory to induce you to recommend its trial here?—I think it is an exceedingly feasible plan, and that it *ought* to be tried (unless already proved to be inefficacious) especially as I gather from the excellent account given that in previous plagues of voles in Germany, almost every other method had proved ineffectual—such as offering rewards for dead animals.

1401. You say "almost" every other method; are we to assume that this method of Professor Loeffler's has been tried before?—No; I mean every other method employed had really not been efficacious. It is of interest perhaps to mention that in one of the great plagues of mice in Germany, the mice disappeared with great rapidity in the course of some two months, and an observer who visited the plague-stricken district noticed that the mice were diseased before they disappeared. It is impossible from what he says to gather what the disease was; he only mentions that the mice were covered with a scurf on the skin. (*See* Appendix VI.)

1402. It seems to me that an experiment such as has been suggested is one of extreme scientific interest, and one would like to know (in the event of its being thought desirable by the Committee) whether you would be prepared to make an experiment on a limited scale, with the view of telling us the results more definitely than we know them at present?—I should be quite prepared to do so on such a scale as would suffice for the purpose.

1403. (*Chairman.*) You are accustomed to scientific research, and therefore you set a proper value upon exact terms. You used a term in regard to this system of Professor Loeffler, and I should like to know if you used it advisably. When you consider that the plan has to be applied to a district about 50 miles long and about 20 broad, is it your intention to say that the application of a system, the success of which depends upon the mouse swallowing a piece of tainted food, and in regard to which it is not proved that the disease is communicable by contagion, is "exceedingly feasible." You said, in reply to Mr. Harting (A. 1400) that it was "an exceedingly feasible plan"?—Well, I do not know that I am disposed to modify that yet. I think it is a feasible and more than feasible plan. But the fact is that, in using such an expression as that, one is involuntarily comparing the plan with other suggested plans. I think it is more feasible than any other method that I have heard suggested.

1404. You admit that the extent of area affected is an important point of difference between the experiments you propose and experiments conducted in a laboratory?—I should infer very little from the experiments made with caged mice. That is only a first step that merely induces one to try it on a larger scale. and I should not infer, or think, that we have anything like conclusive evidence that the plan would be efficacious until it has been tried on a larger scale.

1405. What I mean is this. In the cage experiments did not the effect of the plan depend on the surviving mice eating the dead ones?—No, it depended on the certainty that the mice will eat the organism or culture either in the bodies of dead ones or in the food. Nobody can say that there is any assurance that field mice in a wild state will eat what is put down for them, but that applies with greater force to mineral and vegetable poisons.

1406. Are you aware that most of the witnesses have expressed themselves as hopeless in regard to the use of poison, owing to the extensive area affected by the plague?—I was not aware of that. I think it would be a very difficult and extensive undertaking this of Professor Loeffler's.

1407. Do you think, in short, that the application of any poison, either bacteriological, mineral, or vegetable, by a farmer occupying 6,000 acres would be at all feasible?—Yes, I think it is feasible. It is no doubt a matter of difficulty, but if the loss is great, it may be worth while to put into operation a method that is difficult.

1408. Having due regard to the expense?—Difficulty, of course, means expense, I take it.

JOHN WHITTLE, Kinnelhead, Moffat, examined.

1409. (*Chairman.*) Are you tenant of the farm of Kinnelhead?—Yes.

1410. What is the extent of it?—It is 7,600 odd acres.

1411. Is it in this neighbourhood?—Yes, a short distance from Beattock station.

1412. How long have you been in it?—Five years past at Whitsuntide

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1413. Has your land suffered much from the voles?—Very much since two years ago.

1414. Then they appeared with you about the same time that they appeared on other farms. Can you tell us the exact date, or the approximate date, when you first noticed them in great numbers?—At the back-end two years ago.

1415. You mean the autumn of 1890?—Yes.

1416. Can you account in any way for their appearance?—The only reasons I can give for it are the want of burning, the destruction of vermin and hawks, especially the kestrel hawk, which ought never to be destroyed, and the destruction of the owls and weasels.

1417. Previous to that time, when first you knew the place, were there more birds of prey and weasels on the ground than there are now?—A great many more.

1418. Then would you say that the keepers had been more active in their destruction?—Yes; the British gamekeeper is always that way inclined.

1419. But the British gamekeeper was there before you were, was he not?—Of course he was there before, and I know he always destroys what he comes across in the way of vermin.

1420. The Committee wish to have the result of your actual observation rather than your opinion about the British gamekeeper. We wish to know what the keepers on your ground have done?—I say that if they can get a chance of killing a hawk or owl they will do it.

1421. Are we to understand that they have done so during the past year?—Yes; there is a gentleman in this room who has seen them killing vermin on my farm within the last six months.

1422. But have you remonstrated with the keepers?—I gave them a good swearing, if that will do any good.

1423. And they did not pay any attention?—(No answer.)

1424. How long did you say you have been on the farm?—During the last five years.

1425. Where were you before that?—I was on a farm in the Closeburn district.

1426. During these five years have you observed a diminution in the number of hawks, weasels, and other vermin?—During the first three years there were very few vermin, I may say, in the way of owls; but the owls during the last two years have doubled in number, and that is through the owls, and the hawks as well, following the mice.

1427. Yes, but you have attributed the appearance of voles upon your farm at Kinnelhead to the destruction of vermin by the keepers. Now, what we want to know is whether there were fewer vermin in the autumn of 1890 than when you first came to the farm?—There are fewer vermin now than when I first took the farm, but, as I said before, they have doubled during this last year, attracted by the voles.

1428. And the keepers are not killing them now, I suppose?—Do not fear! They will kill them all along if they get the chance.

1429. Now, Mr. Whittle, I do not ask you to speak from your knowledge of the British keeper, but from the observation of his habits which you yourself have made, and I ask you has he been killing them as a matter of fact during the past 12 months?—He was up there the other day, when there was an uncommon bird (the raven) which has probably been seen by few gentlemen in Dumfriesshire. I have ravens at Kinnelhead, and I know for a fact that they took a great many mice; and I know that the nests of these corbies have been harried and destroyed this year by the keepers. Not only that, but foxes, which kill as many mice in a day as corbies or owls, have also been destroyed. I have lost a few lambs with the foxes myself, but I think they ought never to be destroyed. Of course, I know that a shepherd will not agree with me in that.

1430. But do not you think that foxes might become too numerous?—Yes, but when they do you can always kill a fox when you cannot kill a mouse.

1431. About the ravens' nests, may I ask who harried them?—I do not know whether it was owing to the instructions of my proprietor or not, or whether it was owing to the instructions of the factor, Mr. Hannan, but I know that it was done by the keepers in accordance with instructions which they had received from some one.

1432. Who is your landlord?—Mr. Hope Johnstone.

1433. And the game is in his hands?—Yes.

1434. What loss do you reckon that you have suffered on account of the voles?—Do you mean taking it for the whole period? because I can give it altogether, or for separate years. Altogether I say I have lost about 1,013*l.*

1435. But how do you make it up?—I fed 3,000 sheep at 4*d.* per week. For six weeks that comes to 50*l.* per week. Then, for maintaining sheep away I put down 38*l.* I will put this very plain. At Whitsuntide I had a break with Mr. Hope Johnstone. Supposing my sheep had been 2*l.* apiece, and I paid 50*s.* for ewe and lamb when I went in—but I will only take them at 2*l.*, although I see that the blackfaces in the North have been valued at 45*s.*

1436. But let us understand. Calculated at that price, what have you lost by deaths?—I have lost 675*l.*

1437. What would be your death rate for the last five years?—It was two to the score.

1438. And how many score have you?—I have 150 score off and on.

1439. I do not think you understand me. I mean what would be the normal death rate?—The normal death rate was a quarter of a sheep to the score until last year, and it is now two sheep to the score.

1440. Well, I make that out to be eight times the average death rate?—That is it.

1441. Had it not been for the damage done by the voles, would you have considered this to be a good spring?—Yes, I would have considered it to have been the best season I ever had on this farm. We had a very good back-end, and there has been no storm—at least very little, if any, storm to do us any ill.

1442. Have you any suggestions to make other than those you have given us?—I have read the newspapers carefully. I do not know whether those gentlemen who have been experimenting in Thessaly will do any good, but I should be very willing to keep any man who would come to me for three weeks if he could do any good by inoculation, and that, in my opinion, is the only way to get rid of the voles.

1443. (*Earl of Minto.*) Do you think the voles are still increasing or decreasing?—I think their numbers are now double, or very nearly double, what they were formerly. We have been killing as many as we can, and we have had holes made 18 to 25 inches deep. We have tried the effect of a cat tethered with a string, and it has been of no use. We have tried dogs, and I think that is the best plan.

1444. Do you know how many you have killed with dogs in a season?—Well, I cannot tell you how many thousands, but it was a good many. I think we used five or six terriers.

1445. Do you think that method keeps them down?—Yes, I think so. And I may say that the ordinary crow has destroyed a lot of voles' nests and harried a lot of young ones. It is supposed that the ordinary crow does not take the old mice, but I say it does. The common crow has done more good than any other bird in Dumfriesshire—I do not care whether they are hawks or owls.

1446. Then have you got plenty of ordinary crows?—There was not an ordinary crow on the farm until six weeks ago, and they have done more good since they came than anything else. You can see hundreds of nests pulled out and the young mice destroyed.

1447. Have the keepers tried to kill the crows in the low country about you?—I cannot speak as to the low country.

1448. Do plenty of crows come up to you then?—Yes, there are plenty now.

1449. (*Chairman.*) You mean rooks, I suppose?—Yes, young rooks.

1450. (*Mr. Elliot.*) Did burning not do any good with you?—I think burning does a great deal of good. On the ground that was burned last year and the year before there are now very few mice—that is, in comparison with the ground not burned.

1451. Do you advocate more burning then?—Yes, I do.

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1452. And are you prevented from burning by your lease?—I am prevented from burning the white land, but I am allowed to burn a twelfth part of my heather.

1453. Would you burn more if you had liberty to do so?—I would burn the low ground, because the more cover you leave the better for the mice. If you leave the ground rough, you keep the natural enemies from having a chance at them?—But there is the proprietor, you know, who receives the rents, and who does not care twopence if he receives the rent what becomes of the tenants. I pay him my rent—do not be afraid of that—but I think it is a hardship to have to pay when he will not let me burn the natural proportion of the heather that ought to be burned.

1454. In fact, you think by this restriction in regard to burning, you are prevented from managing your farm as you would otherwise manage it, if you had your own choice?—That is it.

1455. (*Mr. Gillespie.*) Are the voles very prevalent on the white land as well as on the heather?—They are worse on the heather just now, owing to the white land having been burned.

1456. Then, may we take it that you have observed a perceptible decrease in the number of vermin since you entered upon the farm until the present time when they are attracted by the mice?—Yes, except in the case of owls.

1457. What about the owls?—Well, in the keepers' opinion the owls are still vermin.

1458. Then, would you say from your own observation that the keepers were killing the vermin very rapidly until such time as the mice came upon the farm?—Yes, and more than that; they have been killing them up to the 26th May last.

1459. (*Professor D'Arcy Thompson.*) Did you apply for permission to burn more heather than usual this year, owing to the exceptional circumstances of the case?—I think you may have noticed in the newspapers that when we had a meeting at the Royal Hotel, Edinburgh, Mr. Carruthers was instructed to write to all the proprietors to ask them what they could do for us and to request permission to burn, not to the 11th, but up to the 25th of April, and that was done.

1460. (*Mr. Harting.*) Was the answer adverse?—I do not know what the reply was as regards the white land. But they asked me if I would look over the keepers when they were burning. I wish to say that my factor, Mr. Hannan, did not reply to my letter about the burning of the heather.

1461. In other words, you did not get permission to burn the heather; am I right in understanding that?—Well, I had a bargain, of course, for the heather.

1462. And the objection, of course, to burning the heather would be on account of the cover it affords for game?—Yes, that would be the reason. But as I have said, they seemed to think the increase of the voles had principally begun in the long heather. There can be no doubt about that, and that being so, I think they ought to have given the benefit of the doubt (if there was any doubt) to the tenant, because the shorter the heather is, the better opportunity there is of getting at the voles.

1463. Provided it is burned early enough in the spring?—Yes.

1464. (*Chairman.*) You said that you had tried cutting holes without any success?—I think I tried two or three, or something like that. A gentleman at the Edinburgh meeting made some remarks about the advantage of digging holes or pitfalls. If he were here to-day I should like to ask him one question, viz., how many holes does he think it would take to cover my farm of 7,600 acres, and what does he suppose would be the cost?

JOHN MARCHBANK, Shepherd at Loganhead, part of the farm of Kinnelhead, Moffat, examined.

Mr. J. Marchbank.

1465. (*Chairman.*) You have heard what Mr. Whittle has told us. Does your experience agree with his?—Yes.

1466. Both as to the extent of the visitation and as to the causes which have led to it?—Yes.

1467. You think it has been caused by the decrease of the birds of prey and of the weasels?—Yes, I do. I think it was caused by the destruction of the owls, hawks, crows, and weasels, and I think we want liberty to burn more heather.

1468. Do you think the seasons had anything to do with it?—No, I do not.

1469. Was there any unusual roughness of grass in 1890?—Yes, it was rougher in the back-end of 1890 than it was before.

1470. Do you think that roughness had anything to do with the increase of the mice then?—Well, of course, it gave them more cover, and their enemies could not so well get at them.

1471. What is the state of your stock now?—It is very bad.

1472. Is it in low condition?—Yes, in very low condition. The whole stock is very much reduced in condition.

WILLIAM BROWN, Shepherd at Middlegill, Moffat, examined.

Mr. W. Brown.

1473. (*Chairman.*) You are shepherd at Middlegill Farm?—Yes.

1474. How long have you been there?—16 or 17 years.

1475. Have you ever had anything like this plague of mice before now?—No, we have not.

1476. And did it come upon you suddenly?—Yes, it did.

1477. When was it first noticed?—In June and July 1891, and on to September, when they began to be very numerous.

1478. And what caused it, do you think?—I think it was owing to the owls, hawks, and the weasels being destroyed, and to the want of burning also.

1479. Before the voles came you had no objection to the destruction of hawks and vermin had you?—No.

1480. You did not know what good friends they were then?—No.

1481. Whose land are you on?—Mr. Hope Johnstone's.

1482. Is there much game on it?—There is not a great deal of game, but there are black game and grouse.

1483. What remedy do you think the best?—I think if the hawks and owls are left alone, and if we had leave to burn more these would be the best remedies.

1484. You believe in burning then?—Yes.

1485. Would you burn all the rough land?—Yes, I would, because I think it allows the birds to get at the voles' nests.

1486. But is not the rough ground of some use in winter?—Yes, it no doubt is, but it is not much use just now because it is all cut.

1487. Then, do you think that poison is of any use?—Well, we tried it in the low ground in the meadows and it had some effect there. But we did not try it on the hill.

1488. Would you consider it useful at all over a great extent of ground?—No, no use at all, because it would be very difficult to apply it.

1489. (*Mr. Elliot.*) You say that more burning would be advantageous?—Yes.

1490. Why?—We burn a good deal as it is, but the gamekeepers found fault with us for burning.

1491. But you can burn surely if you have the liberty to do it?—Yes, but the keepers prevent us. They come and "kick up a row" if we happen to burn too much.

1492. But if you have permission to do it, they cannot object—they cannot prevent your burning what you think proper. You are a strong-looking man, I am sure, and you should be able to hold your own with a keeper?—Oh, well, but they do prevent us all the same. They object.

Mr. W. Wilson.

22 June 1892.

WILLIAM WILSON, Shepherd, Ruskinhope, examined.

1493. (*Chairman.*) You are shepherd at Ruskinhope?—Yes.

1494. What sized farm is it?—About 2,000 acres, or thereby.

1494*a*. What class of land is it?—It is white land.

1495. Have you been at Ruskinhope long?—12 years past at Whitsuntide.

1496. Are the voles very numerous with you?—Yes, all over the land. It is the worst land I have set my foot on this season with them.

1497. Did they begin with the bog land?—They are on the white land at present.

1498. What means have you tried to get rid of them; have you tried poison?—Yes.

1499. On what kind of land?—The low land and the meadow land.

1500. With what result?—With no effect.

1501. How did you apply it?—We put in into the holes.

1502. Did you find that you killed any voles at all with it?—No, we did not.

1503. What do you consider the best remedy?—Well, poison is of no use at all, I think. I consider the best thing is to let the crows and the "hoodies" and such birds as these alone, and the weasels too.

1504. Has your stock suffered much?—Yes, very badly. We had to feed through half the winter.

1505. What sort of hay have you?—The worst crop we ever had last year, and we shall have none at all this year owing to the mice.

1506. Did you feed through the winter?—Yes, with corn and hay from the end of January.

1507. Will you have to do so again?—Yes, if the mice do not disappear.

1508. (*Earl of Minto.*) Is there any game on your farm?—Yes.

1509. Is the shooting let?—Yes.

1510. To whom?—To a Mr. Wood.

1511. Have the keepers killed down the vermin very much?—Yes.

1512. More so than in former years?—For two or three years past they have; but they have not killed any within the last 12 months.

Mr. G. D. Ritchie.

GEORGE DEANS RITCHIE, tenant of Ruskinhope, examined.

1513. (*Chairman.*) You are tenant of the farm of Ruskinhope?—Yes.

1514. I understand you wish to tell us something about experiments you have made with poison?—Mr. Paterson, of Birthwood, the chairman of the committee which was formed some time ago, handed me this sample of poison to try on my land.

1515. Is that the German poisoned grain?—Yes. I also received the tin tube with which to put it into the holes and I spent the best part of two days doing that in a park in front of the farmhouse.

1516. That is enclosed ground of course?—Yes, we thought we would give it a fair trial. The third day afterwards, on going over the park, we could see neither dead ones by digging the ground, or on the surface. They are now as bad as ever. We tried the poisoned grain in the tin box. We put a vole in the box and found it dead next morning, but of course I cannot say whether the poison killed it or not.

1517. You came to the conclusion as a result of your experiments that poison was of no use?—Of no use at all events with this particular form of poison. I have not tried any other.

1518. But with other poisons?—I think it would be impracticable.

1519. Have you any suggestions to make except those already mentioned? No, I have none, except that I think the proprietors should relieve the tenants of part of their rents in the present exceptional circumstances.

1520. But that would not help the mice would it?—No, but it would help the tenants. The feeling over the whole infested district is, that if the Commisssion cannot do anything to get rid of the voles, it should look at this other question:—We want to know where the next half year's rent is to come from; if my farm cannot now keep so many score of sheep, what am I to do without them. I took the farm only, to mention my own case, in 1890. That was a most unfortunate year for me, for stock was then very high in price, and prices have fallen since.

1521. If the voles had been on the farm in the numbers they have been since, would that have modified your offer for the farm?—I should think it would.

1522. (*Mr Gillespie.*) Can you give us any idea of the death-rate on the farm?—Of course, I cannot tell you about the death-rate in the year I took the farm. There were 48 ewes wanting lambs the year I took the farm, six score in each hirsell, 220 lambs. This year I have a score less deaths, owing to the Indian corn I gave the sheep during the winter.

1523. Well, but is your crop of lambs less than in an ordinary season?—Mr. Paterson's year was a good year I understand, and he wanted 48 lambs. I want 220 this year.

1524. Do you mean on the average?—Mr. Paterson's was an average, and the year I took the farm there were 48 ewes wanting lambs.

1525. Can you give us any idea as to the condition of the sheep now? What is the relative condition of the sheep at the present time as compared with an ordinary normal year?—They are very bad, very lean, and I will not be able to keep up the stock with the young sheep I have on the ground. The old sheep are losing wool every day. I spent 100*l*. on Indian corn last season, for I thought that was better than taking the sheep off the ground.

1526. (*Professor D'Arcy Thompson.*) I suppose in speaking of the large losses you have sustained on account of the action of the voles, that is apart from the depreciation of stock on account of the fall in prices which has taken place?—Of course, but we cannot help the fall in prices. If I parted with my stock now I should lose 1,000*l*. or 1,200*l*. on the amount I paid for it.

1527. You would say then that the loss by depreciation of value of the stock has been 33 per cent.?—Yes.

1528. What would you estimate your loss by the vole plague at?—I cannot tell you, but I know this, that I have for two years had to pay the rent out of my own pocket, and I shall have to do so again.

1529. (*Mr. Gillespie.*) Did you winter your hoggs away?—No.

1530. Previous to this year, did you winter any of your ewes away?—No.

1531. So that the whole stock was wintered at home?—Yes, always. I may add that my father had a stock previously which was the healthiest stock in the county; now it is the unhealthiest that I know.

1532. And do you attribute that to the voles?—Yes, I think mostly to the voles.

Mr. T. Aitken.

THOMAS AITKEN, Shepherd at Archbank, examined.

1533. (*Chairman.*) You are a shepherd at Archbank?—Yes.

1534. And how long have you been there?—For 37 years.

1535. Is the plague of voles bad on your land?—Yes, very bad indeed.

1536. Had you ever such a plague before?—Never before.

1537. Or anything approaching it?—No, nothing like it.

1538. But there have always been voles on your ground, I suppose?—Oh, yes. I have always seen them ever since I came on the land.

1539. What do you think caused them to increase then?—It was in the spring of 1891 that they did increase.

1540. But I am asking you what the cause of that increase was?—I suppose it would be the killing of their natural enemies.

1541. They had been unduly killed, you think?—Yes, they were killed. I have not seen a weasel these last two years.

1542. Used you to see them more plentiful, then?—Yes, regularly I saw them, but they have been made away with one way and another.

1543. Has the loss in the stock been great?—Yes, it has been heavy this year—much heavier than it has been for years past.

1544. Would this have been a favourable season but for the voles?—Yes, I think the best we have had since 1860.

1545. Have you had a heavy death rate among your ewes?—Yes, and we would have had a heavier death rate still had we not kept them up. We had as many as 300 hand-feeding at one time.

1546. Was that on hay?—On hay or turnips.

1547. (*Mr. Elliot.*) What is the state of the stock now. Is it in good condition?—The old sheep are not so very bad, but the young sheep are very poor this year. It would have been a greater loss still had it not been for the dry weather we had.

1548. Did you feed during the winter and the spring?—We had a good deal of feeding. As I have said, we fed 300, but that is not all our hill stock.

1549. Had you any sheep off the farm during the season?—Yes, I had about four score off for six months, and then we had in addition 300 on turnips and hay for two months.

1550. Can you tell us about the expense?—No, I did not heed about the expense. If they got their feed that was all I had to do with it.

Mr. M. Carthew Yorstoun, Commissioner to the Duke of Buccleuch at Langholm, examined.

1551. (*Chairman.*) You are the Duke of Buccleuch's commissioner at Langholm?—Yes.

1552. During the year that attention has been drawn to this plague of voles, can you say whether any application was made by the tenants to you for an extension of the time for heather burning, or other exceptional measures?—No application was made to me, but I wrote to every tenant on a hill farm asking whether in his opinion an extension of the time for burning would be any advantage in decreasing the number of voles or checking their increase. An answer was received from every one of them; three-fourths of them thought that such an extension would be of advantage, and each of them received permission to burn from the 14th to the 28th April. I may say that in conversations which I had with some of them, most agreed that the extension of the time for burning would be of very great value, perhaps the most practical thing yet suggested. The remainder to whom I wrote said they had already burned as much as the ground would stand. They did not think any advantage would come of it, and they did not ask any extension of time.

1553. Have you any remarks to offer from your own observation as to the diminution in the numbers of birds of prey and weasels. Your knowledge of the ground, I may take it, extends over a considerable number of years?—Sixteen years.

1554. In that time have you noticed any such diminution?—No, I am not prepared to give an opinion on that point from my own observation; but perhaps I may be permitted to say, with regard to one portion of the estate, that it contains a very large shooting, running to nearly 30,000 acres—about 29,000 acres—and it has been let for some years past to game tenants. But previous to 1886 it was not let, and it was practically waste country so far as game was concerned. There had been no vermin-killing up there for probably many years, longer than my knowledge of the district goes back, and up to the year 1886. In 1886 the shooting in that district was let to a gentleman who put two extra keepers on the ground and preserved the game. Now a good deal has been said about the number of vermin killed by them, but I wish to point out, and allow the statement to go to the public, that three keepers, over such an extent as this—30,000 acres of ground—during the three years this gentleman was there, could not have cleared off the natural enemies of the voles to such an extent as to cause this sudden and great increase in their numbers.

1555. But as a matter of fact you do not know how much they did kill?—I am informed that they did not kill owls, but how many other vermin they killed I cannot say, for no returns were made to me.

1556. (*Professor D'Arcy Thompson.*) Are the Duke of Buccleuch's tenants in any way restricted as to the amount of heather they may burn?—Yes; there is a definite proportion fixed. I should say, however, that burning is in the hands of the keepers—it belongs to the game department—and I have nothing to do with it. But this year free burning was permitted during the extended period of which I have spoken.

1557. During that time the tenants might have burned as much as they chose?—Yes, for this year only, or in any year in which they might apply for and receive permission.

1558. As a rule, burning is rather in the hands of the keepers than the farmers?—Speaking generally, the farmers do not wish a very large proportion of their acreage to be burned. The burning has to go over a certain number of years.

1559. (*Mr. Gillespie.*) Previous to 1886, you say no vermin were killed in Eskdalemuir?—No, I cannot say that, but I can say that the ground was never shot over either by the Duke or his family or his friends, and that almost answers the question. But that, as I have said, is in the hands of the game department, and I cannot say that orders were not given for the destruction of any vermin there. At the same time, I have reason to think that even if orders were given for such destruction, it would only be an infinitesimal quantity of vermin that would be killed over such a great stretch of ground.

1560. But we were told yesterday that vermin were killed on Eskdalemuir. You do not know anything to the contrary?—I have no information to the contrary.

1561. Is there a restriction as to the proportion of ground that may be burned?—No, there is no proportion mentioned in any written agreement with the tenants.

1562. So that it is entirely in the discretion of the keepers how much is to be burned?—This discretion would seem to have been observed properly, for I have not heard one single complaint on the part of the tenants.

Adjourned to the 23rd instant at Thornhill.

At Thornhill, Dumfriesshire.

FIFTH DAY.

Thursday, 23rd June 1892.

PRESENT:

SIR HERBERT MAXWELL, BART., M.P., IN THE CHAIR.

THE EARL OF MINTO.
REV. J. GILLESPIE, M.A.
WALTER ELLIOT, ESQ.
PROFESSOR D'ARCY THOMPSON.
J. E. HARTING, ESQ., *Secretary.*

Mr. R. Service.

23 June 1892.

Mr. ROBERT SERVICE, of Maxwelltown, Dumfries, nurseryman and seedsman, examined.

1562*a*. (*Chairman.*) You have studied natural history for some time?—Yes, ever since I was a child.

1563. Has your attention been directed to the prevalence of voles in parts of this neighbourhood, and have you visited the ground?—Yes, I have been over a good many of the farms infested with voles during the last two or three years.

1564. Will you state the general result of your observation?—I have a written statement here if I may be permitted to read it.

1565. Certainly, read it. (*Witness reading*)—As regards the former status of the short-tailed vole, it was generally distributed everywhere throughout the district, not only on the sheep farms, but all over the country from the shore to the highest hills. Scarcely a season has passed in my remembrance in which these voles have not been present somewhere or other to a destructive extent. Sometimes it might be on a few acres of meadow land or in the corner of some grass park, or in young plantations, or on patches here and there on the sheep farms. Occasionally these sporadic outbreaks might be pretty general, but without attracting any public notice. Regarding previous outbreaks, in the autumn of 1864 a very destructive outbreak occurred in this immediate locality. It was principally confined to the Drumlanrig plantations, where the voles barked the trees and the bushes, and their ravages continued till 1867. Pits were dug in the plantations, and the late Dr. Grierson of Thornhill has often told me that upwards of 30,000 voles were killed in them in the course of this attack. From a statement in the local Natural History Society's Journal it seems that another species of vole, the bank vole (*Arvicola glareolus*) was also implicated, and it is said that both species were at that time very common. Acting on the advice of Dr. Grierson, the late Duke of Buccleuch instructed the gamekeepers to preserve the owls, the kestrel, and even the magpie, and this protection was extended to these birds for some six or seven years following. The next outbreak of voles was in 1875 and 1876, but was neither so destructive nor so general as the present one.

1566. That is hardly in accord with the evidence we had yesterday at Moffat, where several witnesses said there was no outbreak in 1876 to speak of. I know that they were very generally distributed at the time, for I remember it myself, but they were nothing like so destructive as they are at present. (*Resuming statement*).—The present plague of voles really started during the fine season of 1887. Since then there has been an annual increase culminating in the present state of the sheep farms. As to the probable cause of the plague, I have formed the opinion that a succession of dry springs is very favourable to the increase of voles, and is in fact most probably the main cause. Sheep farm lands are mostly wet and spongy. A dry spring enables the voles to breed in comfortable nests, and the grass and other plants come up early and strong, covering over the nests from the arch enemy of the vole—the common rook. I submit a statement of the rainfall in the spring months previous to and during these vole outbreaks. The statement which I now hand in has been prepared by Mr. Dudgeon of Cargen. (*See Appendix V.*).

1567. This statement does not show the average rainfall?—Yes, the average for 35 years is stated there.

1568. These observations were taken at Cargen, I see, that is a lowland district?—Yes, but the principle may be the same although the increase may vary.

1569. I see the statement is brought up to 1892, and that for the six years including and up to that year the rainfall is under the average?—Much under the average.

1570. When do you think the voles begin to breed?—Earlier or later in March according to the season.

1571. To return to rainfall, I see that the rainfall in spring of 1890 and 1891 was not much under the average, for 1890 it was 4·83, and in 1891 it was 4·74, the average being 4·91?—But the total for these three spring months of 1890 is 4·83; that is nearly four inches under the average, and it is a little more for the following year (1891), and more still for the present year (1892).

1572. I see you have a row of figures (the last row) which you have marked "means," does that indicate the "means" of the whole period?—It is the mean of six years immediately above, there is a row of figures that give the "means" for the thirty-five years at the bottom of the statement. *Witness* (resuming reading):—Regarding the breeding habits of the short-tailed vole, under normal circumstances it is very seldom that more than four or five young are found in the nests. During the present outbreak the average number of young has gone up, and although I have not myself found more than 10 in one nest, higher numbers are constantly reported, and nests containing six to eight are found very commonly. There is every indication also that the individual pairs at a far more rapid rate than usual. I have in several instances killed pregnant females that were at the same time suckling young. In going over Middle Gill on the 20th June instant, I noticed a somewhat remarkable change in the choice of nesting sites. Usually the nests are placed amongst any rough vegetation on the surface of the ground. On Middle Gill, however, the "roughness" has all gone, and although many hundreds of nests were passed sticking out from irregularities of the surface, these were in every instance torn up by the rooks. The voles had thus been driven to seek some other protection, for they have destroyed their own natural shelter, and no fresh grass has grown. So the nests were placed rather deep, to the distance of a foot or more, in the centre of the little "foggy knowes," as the shepherds term them. The soil in these little raised patches has been so much burrowed as to be easily kicked over, and whenever we came on such a spot and kicked it up, there were the nests underneath. This may perhaps appear but a small matter, but it is a noteworthy deviation from the usual habits of these voles, and I have no doubt that they have been driven to it by the voracity of the rooks. With reference to the relative proportion of the sexes, statements have lately appeared to the effect

that there is an overwhelming disproportion of males to females. I have not observed this, in fact, out of 33 voles I killed on June 20th, 18 were females and the remainder males. As to the natural enemies of the voles, much has been said on behalf of the theory that the destruction of raptorial birds in the interests of game-preserving has caused this plague. It must be pointed out that just previously to this outbreak, owls and hawks were decidedly more plentiful than they have been in this district at any time within my recollection. Over a large portion of the stewartry of Kirkcudbright, and in some parts of Dumfriesshire, gentlemen instruct their keepers to spare owls, and the owls being scheduled in the Wild Birds Protection Act, gamekeepers and others, as a rule, observe the law during the close season. Of course I do not say that there has been anything like a full head of birds of prey, but even if there had been, it would not have prevented the vole plague, though it might have mitigated its severity. And just now all along the infested farms there are more kestrels and owls than the oldest of the residents can remember, and yet the stragglers only of the vole armies are being devoured.

Every shepherd who comes upon an adder kills it as a matter of duty, although mice are its favourite food. Foxes are not tolerated on the hills, and probably for good reasons. Still they kill large numbers of mice and such small deer. Polecats have been all killed; weasels and stoats have become very scarce. Although these animals are undoubtedly great devourers of all the smaller mammals, yet they are never very plentiful on the hills, and they always prefer the woods and copses and the hedgerows and the arable farms. Special notice should be taken of the great immigration of short-eared owls that has taken place. Every autumn more or less owls of this species put in an appearance, remaining till spring, when they again disappear. As a breeding species throughout Dumfriesshire and Galloway the short-eared owl has hitherto been considered rare. The late Sir William Jardine found some pairs of this owl breeding at the head of the Water of Dryfe in this county, but that was over 60 years ago. Some 40 years since, Mr. Hastings, the taxidermist in Dumfries, found for many seasons in succession a pair of these owls breeding at Morton Mains, in this immediate locality. Since then Mr. Henry Kerr of Manchester found young short-eared owls down in Lochar Moss. Some eight or nine years ago I also found young of this species on a Stewartry moor. Last autumn numbers of these birds made their appearance on the hill farms, remained all winter, feeding on the voles, and began to nest at the end of March. As many as 10 or 12 eggs in a nest were frequently reported, and in most instances birds are now rearing second broods. The nests are on the ground, the eggs, as is usual with owls, are laid in batches at the interval of a week or more, and those nests I have seen myself are neatly made of heather and grass stems. (*See* Qs. 183, 215, 473, 1031.)

By far the most effective among the bird and animal enemies of the voles is the common rook or corn-crow, as the shepherds call it, and it is possible that one of the principal among the lesser causes of the vole plague (if you admit certain meteorological conditions to be the main cause) is the destruction of rooks during the past seven or eight years. Within the last 10 years rooks in this district have developed most marked carnivorous habits, taking eggs, young birds, young poultry, young hares and rabbits, and so forth, to an extent they never did before. Consequently, gamekeepers and others have vowed vengeance against them, and many thousands of rooks have been killed in consequence. Along with this development of "carrion-crow like" habits there has been a great increase of rooks with feathered faces, such as I exhibit (specimens handed in).

1573. What observation have you to make about this? These feathered faces, I think, are connected with the development of carnivorous habits in rooks.

1574. Is this a local tendency, this development of carnivorous habits?—There is, I know, a good deal of it in Cumberland. One gentleman there tells me that 40 per cent. of the rooks have the face feathered instead of bare. They have turned almost like the carrion-crow in their habits, and the keepers have been "going for them" lately.

1575. (*Mr. Harting.*) You have noticed that these birds (*produced*) are feathered down to the base of the bill like carrion-crows. What age do you suppose them to be?—I would put them down at 12 months old. They were all shot in the early spring.

1576. Do you mean that these rooks must have been hatched in the spring of last year, and that by this time of year they ought to have had bare faces?—They do not carry the feathered faces through the winter, only for a month or two.

1577. It strikes me that they are all young rooks; very early rooks of this year, and have not yet got their bare faces?—But they were all shot at the beginning of March. Professor Newton had a look at these birds, and he said it was most remarkable, and that he had heard from other districts that this was occurring.

1578. Do you confirm the statement that young rooks after leaving the nests have their faces for some time feathered like crows, and not bare like old rooks are?—Yes, for six weeks or two months; I would not say for more. I do not think they are feathered to the bill during the whole summer.

1579. Then do you attribute the loss of the feathers on the face to moulting or to the result of the rooks digging as soon as they are able to feed themselves?—To moulting; I do not think the feathers are abraided in any way. (*Resuming reading.*) It is an interesting habit of the rooks to go to the hills with their young broods in the early summer months to feed on the hill grub, the larva of the Antler Moth (*Charœas graminis*), and at the same time to tear up the voles' nests and devour the young and blind ones. But of late years there has been a great and serious diminution of the numbers that thus resort to the sheep pastures. This has been solely caused by the immense destruction of rooks, brought about by the development of carrion-crow like habits that I have described.

On some of the Closeburn farms, where the voles have practically disappeared, the nests were found to be badly infested with mites and fleas (*specimens produced*). I found similar fleas in the voles' nests in the Moffat district, but in a less advanced stage (*specimens produced*). On Middle Gill also I found voles very badly infested with *Pediculi*—(*specimens*)—and one vole covered with mites (*specimens produced*).

1580. (*Chairman.*) In reference to the probable cause of this outbreak, have you observed what has been stated by some of the witnesses, that the growth of pasture in the autumn of 1890 and summer of 1891 was excessive, and made the ground very rough, giving the mice good shelter?—That was undoubtedly the case. From the autumn of 1890 up till last summer (that is, the summer of 1891) pastures were very rough indeed.

1581. And is it in accordance with your observation and knowledge that an excessive supply of food of any particular species, especially among the smaller birds, tends to an excessive multiplication of that species?—Most certainly that is so.

1582. You have spoken of the presence of hawks. Do you think that all kinds of hawks alike prey upon mice?—No, it is only the kestrel that does so to any extent. In a case like the present the kestrel feeds entirely upon them.

1583. Does the sparrow-hawk feed on the mice?—No.

1584. And the merlin?—To a very slight extent, I should say.

1585. But mice, you think, are the principal food of the kestrel?—Yes, at present.

1586. (*Earl of Minto.*) You have referred to the plague of voles in former years. Can you tell us about the disappearance of the plague. Did the mice disappear suddenly, or for any particular reason?—They disappeared comparatively suddenly. I rather think that their disappearance was owing to the advent of a very wet season. I think you will find that that view is borne out by the statement as to weather conditions of late years that I have handed in.

1587. But the owls increased enormously, too, did they not?—I do not know that they did so in 1875 and 1876. My memory does not go back to the plague of 1864. The disappearance of the voles at Drumlanrig plantations was entirely due to the pits which were dug, assisted by the climatic conditions. Dr. Grierson said they killed as many as 30,000 voles, but the outbreak was, of course, over a comparatively limited extent of ground.

1588. Can these pits be used, do you think, over bent country. There are very few places where they can be used. My idea is that there are comparatively

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few places on the hill farms where you can use such pits.

1589. (*Professor D'Arcy Thompson.*) When, according to your experience, is the earliest time of the spring at which these voles breed?—I found them breeding in the second week of March.

1590. Would that be exceptionally early?—I think so. I took note of it, as I never saw it before.

1591. Then do not you think your statistics of rainfall come a little too early in the year to make any difference?—No, for I think a dry February dries up the surplus moisture which has accumulated during the winter, and makes the ground comfortable for the voles at the breeding time. If you have two or three months dry weather the hill farms never suffer from wet during the season, notwithstanding how much rain we may have.

1592. Is it not the case that Sir Walter Elliot, in his report regarding the previous outbreak of 1875–76 (*see* Appendix), brought out the fact that these spring months were exceptionally rainy during those years?—That is so.

1593. And that is opposed to your experience of the present plague?—Exactly, but at the same time my statement shows that in former outbreaks the weather was really dry and not wet.

1594. What outbreaks do you mean?—The outbreaks of 1864, 1875, and 1876.

1595. I am talking now of that of 1875 and 1876—I mean that to which Sir Walter referred. It may have been so in Sir Walter's district. It was not so here.

1596. Is the bank vole also increasing at the present time?—It is very abundant, especially in the meadow land adjoining the plantations, but I have not seen it at all on the hills.

1597. Was it abundant in 1876 also?—I cannot say as to that year. I do not know.

1598. The short-eared owl, you say, is increasing, and is a migratory bird. Do the resident species also show signs of increase?—Yes, very much so.

1599. For how many years past has that increase been apparent?—For six years past owls have been increasing.

1600. In other words, then, they were increasing before the outbreak of voles?—Yes, owing to the protection they were generally receiving.

1601. (*Mr. Elliot.*) Do you attribute the increase of voles to the rough pasture?—Yes, to the rough pasture following on a period of dry weather.

1601*a*. Do you include the summer of 1891?—Yes, I do. There was very heavy rain in the autumn, but then the mischief had been done by that time.

1602. (*Mr. Gillespie.*) I observe, from Mr. Dudgeon's return of rainfall, that the three months of February, March, and April of 1875 were unusually dry, making up a total rainfall for the three months of 4·31. But I also observe that the corresponding three months in 1876 were unusually wet, the total rainfall during those months being 13·65?—Yes, and the voles then disappeared.

1603. I would draw your attention to the fact that in February 1876 the rainfall was 6·38, that the rainfall in March was 4·66, and in April 2·61. I would remark that it is deponed to us by many witnesses that the voles were as numerous as ever in the closing days of April 1876. Can you reconcile your theory as to the wetness with the fact that the voles continued as numerous as ever until the weather was again dry?—I should say that those voles were not the voles bred the previous season in which the great increase took place, but that the population reared the previous season still continued their ravages in the spring of 1876.

1604. Then what became of those bred in previous seasons when the dry weather set in? What was there to prevent that multiplication going on?—The wet weather of the spring months of 1876 which you have just mentioned.

1605. But you say that April, at the end of which they disappeared, was a very dry month; at least, it was not a wet month—the rainfall was 2·61. I want to see if you can reconcile the other facts with your theory?—There would be an accumulation of moisture on the hills, the burns would be all full, and the voles would not breed in their usual numbers, because of the breeding-places being filled with water—ankle-deep, perhaps.

1606. Do not you think there was time between the beginning of April and May for the water to subside, especially if the interval was a drying time in point of weather? Do you not think there would be time for that extra water to subside?—I do not think so, because there was much more than an average rainfall in the previous February and March. The water would still be there in May; it would not be drained off by that time.

1607. In connection with this phase of the question I now draw your attention to the fact that this spring has been unusually dry. We never have had, in my recollection, a spring with such a long succession of dry weather, and there does not seem to have been, so far as appears by the evidence laid before us, an unusual multiplication of the voles this spring. Now, according to your theory, would you not expect that there would have been an unusual multiplication of the mice this spring, because of the abnormal dryness of the season?—Well, so there has been. According to my observations the voles are increasing everwhere. They have spread from this district right up to Carsfairn and right along to the Moffat district. At all events, they are no fewer in numbers than they were.

1608. But according to your theory, I submit that there ought to have been a very large increase. Now, according to my reading of the evidence, there has not been a very excessive increase—not such an increase as there was twelve months ago. I want to see how you reconcile that with your theory about the dry weather?—I reconcile it in this way, that the place is already over-populated with voles. The point has been reached where over-population comes in, and disease has also come in. Then, again, birds of prey and other enemies of the vole have increased on all sides, and even supposing that the voles had increased more than before, there are more enemies to keep them down.

1609. (*Chairman.*) Has burning been resorted to also to keep them in check?—Yes, but any burnings I saw passed over the nests without killing the voles.

1610. (*Mr. Gillespie.*) So far as burning has gone it has not destroyed the voles. Is that your experience?—Well, one was killed here and there perhaps.

1611. *Mr. Gillespie,* at this point, read an extract from a newspaper containing an abstract of a paper read by the late Dr. Grierson at a meeting of the Dumfries and Galloway Natural History and Antiquarian Society, in regard to the plague of voles in 1864 in the Drumlanrig plantation. In this Dr. Grierson pointed out that the indiscriminate destruction of the weasels and birds of prey had allowed the voles to gain supremacy.

1612. (*Witness.*) I should like to point out that there is a foot-note to that extract in Dr. Grierson's handwriting, in which he characterises the report as a "mutilation" of what he did say. I know that it was a strong opinion of Dr. Grierson's that the killing down of the so-called vermin was causing that plague of voles in 1864, and he advised the present Duke of Buccleuch's father to stop the killing down. That was done for six years afterwards with good results.

1613. (*Mr. Gillespie.*) With regard to the excessive development of food in 1890 as leading to the increase of voles—do you think it was the cause of the increase? Would you say that the cause of the increase was the quantity of food provided for the sustenance of the voles?—I put that fact down as one of the causes, but the history of this species of vole shows that these outbreaks occur every now and again, both in this country and abroad.

1614. (*Mr. Harting.*) You have told us that you observed before the outbreak that the number of birds of prey had largely increased?—Yes, owls and kestrels.

1615. What kind of owls?—The barn owl, the long-eared owl, and the brown owl.

1616. Not the short-eared owl?—I did not know it at the time.

1617. Do you speak of a particular district, or generally?—Dumfriesshire and Galloway generally.

1618. To what do you attribute that increase? Do you think that the keepers had instructions at the time or previous to the time to abstain from killing them?—There has been a very general movement on the part of the gentry in this district to instruct their keepers not to touch the owls. That was before and since the outbreak, and no one has been touching them since.

It would be little short of a crime to touch them since the outbreak.

1619. Do you think that the statement generally made to the effect that the plague is due to the destruction of the natural enemies of the voles by the keepers is exaggerated?—I say that even if we had had a full head of birds of prey, that would not have prevented the plague, but it would have mitigated it very much. I understand that on the Continent, where there is a full head of birds of prey, they suffer from the plague nevertheless.

1620. You have told us about the number of young voles in each nest. I am anxious to get some more information about the rate of increase. Have you made any observation as to the period of gestation in the short-tailed vole?—Not precisely.

1621. Are you aware that the period of gestation in the long-tailed field mouse has been ascertained by keeping them in captivity, and that it is three weeks? Yes, I am aware of that.

1622. Have you made any corresponding observations in regard to the short-tailed vole?—When I had some young ones caught, I bred from them, but I did not observe the precise time of gestation. But it was about 24 days, I think, to the best of my recollection.

1623. Can you say how many litters they have in the course of a year?—I should say one every five weeks when they are not in captivity.

1624. For what period?—Four or five months. And in the course of 10 or 12 weeks the young are breeding themselves. At least I found young voles 10 weeks old with two or three litters of young.

1625. As regards the bank vole, which you say is chiefly confined to plantations, you have not observed it on hill pastures?—Not at this time. I have got it there, but not just now.

1626. You say that the bank vole is not destructive in the same way to the sheep farms that the short-tailed vole is?—Not to the grass or the pastures.

1627. Have you noticed damage done by them to plantations?—They do much damage there, and I may say in my own trade as a a nurseryman, we have serious losses on account of their ravages, owing to their taking the bark off the foot of the young trees, and as far up the stem as 8 or 10 inches.

1628. Higher, would you say, than a mouse can reach from the ground?—Yes, they climb up the stems by means of the little branches. The bank vole in its habits is nearer to the long-tailed field-mouse than to the short-tailed vole.

1629. Now as to remedies. You have no doubt heard the various suggestions made regarding traps, pit-falls, poisons, and other means. Is there, in your opinion, any remedy which is sufficiently deserving of the serious consideration of the Committee to warrant an experiment being made. What about poison?—I strongly deprecate the use of poison; you would kill all and sundry with it. I do not see anything to prevent the farmers by a sustained and systematic use of dogs and men clearing out the voles in great part in a couple of months.

1630. You believe then in the efficacy of dogs and men, especially if the thing is carried out on a systematic and organised plan?—Yes, but there is no use doing it on one farm only.

1631. Do you think from what you have seen, that that is a practicable method if systematically carried out?—Yes, I think so.

1632. (*Mr. Gillespie.*) I would draw your attention to the fact that in 1887 and 1888 were three spring months which you specified as unusually dry. Do not you think that the voles, according to your theory, ought to have increased abnormally during these months?—They have been increasing very rapidly, and a very great deal since 1887, according to my observations. Just now the voles are swarming on the sheep farms, but it has taken years to arrive at this abundance. They would have to increase over a series of years before they would reach the abnormal number which makes them the plague they are.

1633. (*Professor D'Arcy Thompson.*) Did the bank vole and the common vole show this exceptional increase in the same years?—Yes, we are now finding the bank vole where I did not see it before.

1634. You do not know of a remarkable year for the bank vole apart from the increase of the present vole?—No.

1635. That would support the view that there were external causes leading to a common and similar increase of both?—Precisely.

1636. Do you think at present there is any exceptional increase of other species, such as the water-rat?—The water-rat is extremely common, and will soon be too common.

1637. Has the dry season anything to do with the increase of the water-rat?—Yes, because the vegetation along the banks increases very much, and there is more nourishment to be found than in a wet season, when the vegetation gets soured by the overflow from the burns.

1638. Would you ascribe this general increase of small species to the paucity of natural enemies?—Yes.

1639. (*Chairman.*) You have not mentioned the heron?—I do not know that the heron is an especial enemy of the vole, though it attacks and devours water-rats very commonly.

1640. You never saw a heron on the hills?—No, not regularly, though sometimes I have; but I have seen it knocking the water-rats about in fine style.

CHARLES JOHN MASSEY, Galloway House, Garlieston, Wigtownshire, examined.

Mr. C. J. Massey.

1641. (*Chairman.*) You had the Eskdalemuir shootings from 1886 to 1889 inclusive, and you had the shootings in West Buccleuch also?—Yes, in 1889. I had six farms altogether in the district.

1642. Were the shootings on Eskdalemuir and West Buccleuch not let before?—Never.

1643. Had the others been let?—Yes, the others had been let.

1644. You took means to trap the vermin on the land when you took it?—Yes.

1645. Can you tell us what means you took?—Well, when I went to Eskdalemuir there was only one keeper on the 30,000 acres there. I changed that man with the Duke's permission, and put three men on, all of them my own keepers, and the Duke removed his man down somewhere in the Langholm district. I gave my men orders to kill all vermin with the exception of owls, which they were not allowed to touch. They killed hawks though.

1646. They were not very numerous there?—No; the vermin consisted chiefly of weasels, of which there was a good number. Understand that I am referring now to the Eskdalemuir shootings, where we had those three men on an acreage of 30,000.

1647. Were you furnished with returns from the keepers as to the vermin killed?—Yes, I was.

1648. I suppose in returning the number of hawks killed, they would not discriminate between the species?—No, they were all put down as "hawks," but they were chiefly sparrow-hawks at Eskdalemuir, and a few other species, including the rough-legged buzzard.

1649. What numbers were killed in these years?—I cannot tell you that, because I did not get any return. I have a return, however, of the later shootings I had—at Ropelawshiels and West Buccleuch. But I should like to point out, in consequence of what has been said by another witness at a previous meeting of the Committee, that West Buccleuch is only a small portion of the 10,000 acres which is made up of six farms. Mr. Grieve was in error when he said that all the hawks and weasels killed were killed on West Buccleuch. That is not the case, they were killed on the whole six farms I took in the year 1889. But the keeper happened to live on West Buccleuch farm, and Mr. Grieve evidently thought because the keeper lived on his farm that all the vermin were killed there. That is not the case.

Mr. C. J. Massey.

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1650. Was Robert Bell keeper at West Buccleuch?—Yes.

1651. Did you receive any remonstrance from the tenants about the killing of the vermin on these farms?—Only from Mr. Grieve, who asked me not to kill the weasels.

1652. When was that?—That was in the last year of my tenancy, 1890.

1653. But was that after the voles appeared?—The voles had appeared two years before that.

1654. You say the owls were not shot?—No.

1655. Was that because you believe that owls do not injure game?—As a game preserver, I do not believe they do. I do not allow them to be shot at Galloway House.

1656. Can you say the same for kestrels?—No, I cannot. I believe the kestrel to be a deadly enemy of game. I know that I may differ from the Chairman in that opinion. Not so long ago we shot a kestrel with a young pheasant in its possession in the pheasant rearing field. That kestrel took seventy young birds altogether. It was only killed one night when it was going back with the last for its brood of young.

1657. Do you state that from your own observation or from what has been told to you by your keepers?—I know that one of my keepers shot it. There is no doubt at all about the bird having been a kestrel.

1658. Do you wish to make any statement in reference to the evidence which has been previously led before the Committee?—I should like to say this, that Mr. Grieve has attacked me as a game-preserver in the district in a most unwarrantable manner; for he has tried to make out to the Committee (and he has tried to make it out in the newspaper too), that I had killed all the vermin on the farm of West Buccleuch, whereas the vermin that he referred to was killed on the whole 10,000 acres I took in Selkirkshire.

1659. (*Chairman.*) I think I shall carry my colleagues with me when I say that we did not understand Mr. Grieve to make any attack upon you, Mr. Massey. Mr. Grieve was put into the witness-box and asked to state what he believed to be the cause of the increase of the voles, and it was in answer to that question that he attributed it to the killing down of the vermin?—(*Witness.*) But I refer now to a letter which Mr. Grieve wrote to a Hawick paper.

1660. *The Chairman* said he had a copy of the letter and had read it. It was dated 28th January 1892, and in it Mr. Grieve pointed out that the shootings at West Buccleuch and those on a few more adjoining farms had been let to an English shooting tenant, who had put keepers on the land. Mr. Grieve added that he had been informed by his shepherd that within a short time upwards of 100 weasels and also a number of hawks had been killed. But (continued the Chairman) I do not find it stated anywhere in Mr. Grieve's letter that all these weasels and hawks had been killed on the land of West Buccleuch.—(*Witness.*) I understood that he said so to Mr. Watson, the Duke's head-keeper in the Selkirk district. He represented to the keeper that all these weasels and hawks had been got on his farm.

1661. *The Chairman* said they had the letter there, which spoke for itself. They could not go into the matter further. (*To witness.*) As to the destruction of weasels, what harm do you attribute to them, speaking as a game preserver?—They take the young grouse and young black-game, and, especially in covers, they will take the young pheasants too.

1662. Do you include in the term "weasel" both stoats and weasels?—Personally I have seen both stoats and weasels with the young pheasants in their mouths carrying them away from the pheasant-rearing field. I have shot them myself.

1663. (*Mr. Gillespie.*) Can you give us any approximate idea, if not an exact idea, of the number of weasels and hawks killed on the Selkirk part of the shootings which you rented in 1889 and the following year?—Yes, I can. The first year I had these shootings I had only one keeper on the 10,000 acres. The total number of weasels killed on that ground was under 80. In the second year it was certainly not 40. I believe, speaking exactly, that 37 was the precise number the second year.

1664. I draw your attention to the fact that there is no serious disparity between your statement and that of Mr. Grieve's shepherd as to the number of weasels killed, inasmuch as the shepherd said that he saw what he supposed to be about 100 tails nailed up at the keeper's house. So that you practically corroborate the shepherd's statement?—Yes.

1665. (*Mr. Harting.*) I hold in my hand a letter of yours addressed to the "Hawick Advertiser" of the 4th March, 1892, in which you state that during the two years you held these shootings in Selkirkshire the total number of weasels killed was less than 30. Are we to understand that that is a printer's error for 80?—It should be 80, and the mistake caused a great deal of misapprehension. The keeper himself is now in the room, and can bear out what I have said. He is now on the Netherby estate. You may take it from me that the figure 30 is a printer's error; it was 80 I meant.

1666. (*Chairman.*) It has not been given to us in evidence, but it has been said, with reference to the preservation of owls on the ground, tenanted by you, that you yourself have been known to shoot an owl?—I shot four for the purpose of adding them to the collection of stuffed birds which I have. I believe these were the only four owls ever shot on the place during a period of five years.

1667. (*Mr. Harting.*) About the rough-legged buzzards that you mentioned to us; can you say if they were seen in any numbers?—We got three of them. They seemed to come to the place periodically.

1668. Before or after the mice had disappeared?—They came while the mice were there. Strange to say this year at Galloway House, we saw a very fine one on a Sunday morning trying to get a hen out of a pheasant coop. One of the keepers shot it.

1669. Are you sure that it was on a Sunday morning?—Yes.

Mr. R. Bell.

ROBERT BELL, formerly Gamekeeper at West Buccleuch, examined.

1670. (*Chairman.*) You were Mr. Massey's gamekeeper at West Buccleuch?—Yes.

1671. Did you find much vermin on the ground when you went there?—No, not a great lot.

1672. What kind of vermin did you find?—Mostly weasels.

1673. How many did you kill?—About 70 in the first year.

1674. Did that include stoats?—Yes.

1675. And the following year, how many did you kill?—About 30.

1676. Did you kill many hawks?—About six or seven.

1677. Only six or seven you think?—Yes.

1678. What kind of hawk were they?—Mostly sparrow hawks.

1679. And the others?—One was a kestrel.

1680. Why did you kill the kestrel?—Well, it was an enemy of the game of course, and that is why I killed it.

1681. How long have you been a gamekeeper?—Six or seven years.

1682. How often in that time have you seen a kestrel take game?—Many a time.

1683. What kind of game?—Young pheasants.

1684. Had you many young pheasants at West Buccleuch?—No.

1685. Then, why did you kill the kestrel?—Because they will take the young grouse.

1686. Did you ever see them take young grouse?—No.

1687. Did anybody of your acquaintance ever see them take young grouse?—No, but I have heard of their taking young grouse.

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1688. Would you believe a man if he said that he saw a kestrel hawk taking young grouse?—Yes, if he said it, I would.

1689. Any man?—Yes, if he was not drunk.

1690. When you went to West Buccleuch, were there many voles on the ground?—No, not many.

1691. Did they begin to increase shortly afterwards?—I did not pay particular attention to them.

1692. So that you did not observe what animals were preying on the voles?—No.

1693. You did not know whether the weasels followed them or not?—No.

1694. (*Earl of Minto.*) Did you ever catch any weasels alive to send away?—Never.

1695. (*Professor D'Arcy Thompson.*) Are you preserving very strictly at Netherby?—Yes.

1696. And killing the weasels and the hawks?—Yes.

1697. And the owls?—No, not the owls.

1698. (*Mr. Elliot.*) I suppose the weasels were killed over the whole 10,000 acres?—Yes.

1699. Where were they most plentiful?—About Ropelawshiels.

1700. (*Mr. Harting.*) Were the weasels on the hills?—Yes.

1701. Where the mice were?—I did not notice that particularly.

1702. You were killing the weasels before the mice appeared?—Yes, about 1889 and 1890.

1703. So early as that?—Yes.

1704. Did you employ traps?—Yes, we killed them with spring traps.

1705. Stoats as well as weasels?—Yes.

1706. Which were the more numerous?—I think I killed more weasels than stoats.

1707. Are the stoats on the hills too?—Yes, they are there as well as the small ones.

1708. Have you any recollection of numbers?—No, I have just an idea.

1709. You heard Mr. Massey's statement of the number?—Yes, I did, and so far as I can remember that was just about the right number.

Mr. Massey recalled.

Mr. Massey.

1710. I think I can answer that question by Mr. Harting (1706). Since I went to Galloway House I have taken a very particular note of all the vermin killed, and for that purpose I have a vermin book, which the keepers fill in and bring a return to the head gamekeeper every week. It is sent to me monthly, and I can see for myself from it how many have been killed. We killed last season 556 weasels at Galloway House, and I believe that fully one-fifth were stoats, the remaining four-fifths being little weasels.

James Shaw, Schoolmaster, Tynron, Thornhill, examined.

Mr. J. Shaw.

1711. (*Chairman.*) You are schoolmaster at Tynron?—Yes.

1712. Have you studied natural history?—I cannot say that I have studied very much, but I have always kept my eyes open.

1713. And have you made any observations on the habits of voles?—All that I know can be stated very briefly. I went along with two shepherds and two farmers on the 14th May and took a day to look at the voles. We visited the farms of Kinnelhead, Tynron, and Dalgonar, Penpont. We were taken by the shepherd to see the voles, and there were three dogs along with us—two collies and a fox-terrier. We were not very long about before the dogs secured some of the adult voles. Then we came to the nests of the voles. They were fairly numerous. The largest number of young in any one nest that we noticed was seven. I should say that they would run from four to seven. There were about five, say, in each nest. The nests were on the surface of the ground, on the south side of the farm, where the grass was most luxuriant. We noticed that the young were infested with a kind of tick which has been already shown to the Committee. We got no nest in which the young were not infested with these ticks. We got one or two adult voles alive. We were taken by the shepherd to examine the pellets of an owl, and, to my surprise, this owl turned out to be a short-eared owl. I had formerly got specimens of what I supposed to be the only three kinds of owl frequenting the parish, namely, the tawny owl, the long-eared owl, and the barn owl. Up to that time I did not know that the short-eared owl was also in the parish. To make certain whether this was really a short-eared owl, I got Sir William Jardine's book, giving pictures of the different kinds of owl, and there was no doubt from the description and figure that the owl that we had found belonged to the short-eared species. We were told by the shepherd that at this early date—on the 14th May—the owls had already had broods, and that young ones were seen along with the old ones. Since that they have been laying again, and a second brood will by-and-by be coming on. Sir William Jardine, in his work on the Ornithology of the district, says that the short-eared owl is an occasional visitor here, and that its brood does not come out till August. But here you see we had a case where a short-eared owl had its nest on the ground, and had a brood by the 14th May. And more than that, we found that the short-eared owl had been feeding on mice, for the disgorged pellets contained the skulls and other indigestible parts of voles.

William Fergusson, Shepherd, Craigengillan, Carsphairn, examined.

Mr. W. Fergusson.

1714. (*Chairman.*) You are shepherd on the farm of Craigengillan?—Yes.

1715. How long have you been there?—I was born on the farm.

1716. Is the vole plague bad with you?—Yes, it is.

1717. Since what time has it been bad?—Since the spring of last year—the month of March.

1718. Does it extend over all the ground?—Yes, the whole of it.

1719. And has much damage been done?—There is a good deal of damage done.

1720. What kind of land suffered most?—The bog land suffered most.

1721. Do you use the land for hay?—Yes, we depend on it for our hay.

1722. Have you little meadow land?—Little.

1723. Have the voles ruined the meadow?—Yes.

1724. Did they do any injury to the hay-crop last year?—They did. There was a good deal of it gnawed close to the ground before I cut it. It was, of course, withered, and made hay of very bad quality.

1725. Is there no prospect of hay this year, do you think?—I do not see that there is any prospect.

1726. Owing to the voles?—Yes.

1727. Have they ruined the heather, too?—Yes.

1728. What remedies have you tried?—Burning.

1729. Have you killed many by burning?—I do not think I killed any by burning.

1730. The fire passed over them?—Yes.

1731. Did they go to other grounds?—To a great extent, but still there are some mice on the burned ground yet.

1732. But of course they are more exposed?—Yes.

1733. What sort of sheep have you on the farm?—Black-faced sheep.

Mr. W. Fergusson.

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1734. What number have you?—About 37 score of ewes.

1735. What is the average death-rate among your stock?—The average death-rate for the last five years, including 1891, is 24.

1736. Then what is the death-rate this year?—29.

1737. What was the lamb crop this year?—The lamb crop this year was 643.

1738. And what is the average?—649.

1739. There has not been very much damage done to the crop of lambs then?—Not in numbers, but in quality. They are very inferior in quality.

1740. The condition of the stock is lower?—Yes, and I consider that the season was very much better for stock than last season; in fact, than the average of the last five years.

1741. Had you to hand-feed?—No.

1742. Your ground is not very high?—There is part of it pretty high; it is over 2,000 feet.

1743. Do you have much snow?—A good deal.

1744. Not so much as those further east, I suppose?—I cannot say as to that.

1745. Do you advocate burning?—Yes.

1746. I suppose you cannot afford to burn all the land?—No, but I have burned about half of it this year.

1747. Do you like to keep a bit rough?—We require a little, but if the time for burning was extended, we could burn a great deal more than we do.

1748. (*Mr. Gillespie.*) You said you saw the first appearance of voles in large numbers in the spring of 1891?—Yes.

1749. Have you observed sufficiently closely to form any opinion whether or not they had come from some other locality, or whether it was just the stock of voles that had been on the farm previously, latterly increasing very largely?—I think they had come on to the farm from elsewhere.

1750. Did you see many voles in the previous year in your rounds over the farm; in the year 1890, I mean?—A few.

1751. But not much more than the average number?—No.

1752. (*Mr. Elliot.*) Do you keep wedder sheep on the farm?—No.

1753. You have about 37 score of ewes?—Yes, but there is a Cheviot "hirsell" that I have not spoken about.

1754. How did the Cheviots compare with the black-faced?—They were much worse.

1755. Have you any statistics that you can give us?—Yes; the death-rate this year among the Cheviot ewes was 47.

1756. And what is the average?—The average for the last five years is 30.

1757. How many Cheviots have you?—About 30 score of ewes.

1758. You say you approve of burning?—Yes.

1759. Are you prevented from burning as much as you like?—No; we can burn as much as we wish, but we should like the time for burning extended. I must add that the crop of lambs amongst the Cheviots this year was 70 per cent., whereas the average lamb crop for the last five years has been 80 per cent. fully.

1760. (*Earl of Minto.*) Is the shooting on the farm let?—No.

1761. So that you have no shooting tenant. Have you any keeper on the farm?—No, not at the present time.

1762. You have no reason to suppose that the appearance of the voles is due to the vermin being killed down by gamekeepers?—No, I do not think that, but I think that if the natural enemies of the voles were preserved, they might help to keep the voles down a little. They were I know killed down at Charbrach by the keeper.

1763. Do you know how many were killed?—No. have no idea.

1764. Were they stoats or weasels, or both, that were killed down?—I do not know, but I suppose both.

1765. (*Chairman.*) But you do not know how many were killed in all, do you?—No.

Mr. A Lambie.

ANDREW LAMBIE, Shepherd, Lorg, Dalry, examined.

1766. (*Chairman.*) You are a shepherd on the farm of Lorg?—Yes.

1767. Have the voles been playing havoc on your land?—Yes.

1768. How long have you been at Lorg?—I have been 18 years.

1769. Were you born in the district?—Yes.

1770. Have you suffered from the outbreak of voles?—Yes.

1771. Are there a great number on your land?—Yes.

1772. You have heard the evidence of the last witness?—Yes, I heard it.

1773. And does your experience coincide with his?—Yes, very much.

1774. On what class of land?—About three-fourths of the bog land is entirely useless owing to the action of the voles, and, taking the hill land all over, about a quarter of it is bare, and there is no grass growing on it.

1775. Have you tried burning?—Yes, to a small extent.

1776. Is it of any use, do you think?—Well, it cleans the ground.

1777. It takes away the old withered grass?—Yes.

1778. Have you anything more to tell us without any further questions being put?—No.

1779. (*Mr. Gillespie.*) When did you first notice the voles in very large numbers?—I noticed them increasing about March of 1891.

1780-1. Does your observation agree with that of the previous witness as to the suddenness with which they appeared? Do you think that they came from some other place near you, or that they were bred on the place?—I cannot tell you.

1782. (*Professor D'Arcy Thompson.*) Did you do anything on the farm to kill the voles?—Nothing at all.

1783. (*Mr. Elliot.*) Are their numbers increasing or decreasing at the present time?—They are still increasing.

1784. (*Chairman.*) Is there any winged vermin on the land, or have you any weasels?—I have not seen a weasel on the land this year, nor for two or three years.

1785. Is it high land?—Yes.

1786. Are the weasels killed off then?—Yes.

1787. Who killed them?—The gamekeeper.

1788. Have you seen him kill them?—I never saw him kill them myself.

1789. I want to know what the stock of vermin on the land is?—A few owls have come to us, that is a new thing.

1790. When you say that there are no weasels on the land, do you remember weasels in former years?—Yes, I do.

1791. You believe that they were killed off by the gamekeepers?—The gamekeeper does kill them I know.

1792. You think that there are fewer hawks than there used to be?—I think that there are more this year than in former years.

1793. What kind of hawks are they?—What we call the "red hawk" or the kestrel.

1794. Do you ever see the buzzard?—They used to be there, but they are not there this year.

W. A. McTurk, tenant of Lorg, Dalry, examined.

Mr. W. A. McTurk.

23 June 1892.

1795. (*Chairman.*) You are tenant of the farm of Lorg, Dalry?—Yes.

1796. And the last witness is a shepherd of yours?—He is. He has charge of one of the "hirsells."

1797. Do you confirm his account?—Yes. And I wish to speak of the hawks. Twenty-five years ago one portion of the farm which is rocky used to be a great breeding ground for the kestrel, the peregrine falcon, and the buzzard. All of them used to breed there. Of late years there have been two pairs of kestrels breeding there, but the others have left. The peregrine falcon and the buzzard have both left us. The sparrow-hawk, according to my observation, is an enemy to the mice. I can give a special reason for saying that, because the gamekeeper who resides on the farm where I live at Burlae trapped one last year. That was on a Thursday. He went back on the Monday and found twenty-two mice, or parts of mice, lying around the nest. He saw no trace of a feather near the nest. So I say that the sparrow-hawk, which is almost extinct in the district, is a good mouse-hunter.

1798. Are you certain that this was a sparrow-hawk?—Yes, certain; for it was the blue hawk that builds in a tree. It is the only kind of hawk here that does build in a tree. But I did not see the bird myself, it was only from the description of it that was given to me that I identified it as the sparrow-hawk.

1799. What time of the year was that?—It would perhaps be in the month of April. The keeper did not give me the date, or tell me when exactly it was that he noticed it. It was only in a passing conversation that he told me about it.

1800. You did not see the hawk yourself?—No, I did not. And the keeper himself did not know what kind of hawk it was. It was only from his description that I thought I recognised it.

1801. Are you acquainted with the hobby?—No, I do not know it.

1802. Are you aware that it is a blue hawk like a small peregrine, and builds on a tree?—I never saw one of them to know it.

1803. Are you aware that it is not usual for sparrow-hawks to take mice?—No, I considered them hunters of game rather than of mice.

1804. And of small birds?—Yes.

1805. In short, you are not sure of the kind of kawk to which you are referring?—Well, I did not see it.

1806. Did you ever see the kestrel take game?—No, I have seen it take a small bird occasionally, but the kestrels, to my knowledge, live principally on mice. And so do buzzards—on mice and moles.

1807. Have you ever seen a buzzard kill game?—Never.

1808. But you have seen them, I suppose, on land frequented by game?—Yes, certainly. I have been to their nests and have seen moles and mice lying about.

1809. Do you think they feed on "braxey"?—No, I Never saw them touch a dead sheep or lamb.

1810. Well, now, can you tell us about your lamb crop?—The death-rate among the sheep on my farm is about 1¼ per score; on the average it is ¾ to the score. From the shepherd's account, there are 27 score of ewes on the farm, and there will be over 19 score of lambs this year. The average lamb crop for the last five years was 23 score.

1811. What is your opinion about burning?—I do not believe in too much burning, so high up, for it makes the pasture bare for the following winter. Mine is a very high-lying farm.

1812. Did you ever know anything like the present outbreak before?—Not to the same extent. We have had field-mice ever since I can remember, but never to the same extent as at the present time.

1813. Do you happen to know how far the mice are to the west?—Yes; I know they are as far west as the Kells range, as we call it, to Castle Maddie Braidnock and Dalnaw, on the farm of Garrary Further west of the Kells range there are none.

1814. They have not got so far as the farm of Merrick?—No, they will not trouble that country much. They are too good judges of land.

1815. (*Earl of Minto.*) Have you any suggestions to make?—No, except that the natural enemies of the voles should be preserved. We have no weasels now. It is as rare to see a weasel as it is to see a fox I think the common "grass weasel" is a deadly enemy to the vole. The stoat I do not think is so much of an enemy.

1816. Do not you think something might be done by organisation amongst the farmers for an attack upon voles by men and dogs?—We have tried that with very poor success. It is mossy land, and it is just riddled with voles' holes. Your foot sinks as you walk along, and the voles are just out of sight in an instant.

1817. I do not mean killing them down by the farmers individually, but if all the farmers killed them down at the same time at the breeding season?—We might destroy a few nests. On the 30th May I walked over that portion of the ground which was most affected by them, and we killed a few, but not to any great extent.

1818. Mr. Scott, a previous witness, seems to think that by an organised attack a good deal may be done. He told us that on his farm he had had a regularly organised raid against voles with cats as well as with terriers, and that they killed large numbers. I do not know whether it was the exact result of these hunts, but he told us that the voles had practically left his farm. Well, they are leaving a portion of my farm, but it is because they have eaten it up, and they have to shift. I do not think that terriers could kill a very great number on my land.

1819. Not by a general organised attack?—No. One day five of us were out with four dogs, and I do not think we killed above ten voles. Some days you will kill more, and other days, again, you will not see many voles at all.

1820. (*Professor D'Arcy Thompson.*) Do rooks destroy mice?—Yes, the rooks pull them out of their nests.

1821. And are there plenty of rooks with you?—No, not many up to the hills yet.

1822. (*Chairman.*) Are there plenty of foxes on the land?—Not many with us. There used to be plenty about Cairnsmore, but not now.

1823. And will the foxes kill the mice?—Yes.

1824. But they can hardly be called a friend of the shepherd, can they?—Not exactly.

1825. (*Mr. Gillespie.*) Do you think that the mice are migrating west in a body?—They certainly are coming further down the river at present. On driving down on Tuesday I noticed places eaten that had not been affected a couple of weeks ago.

1826. Do you attribute that to immigration rather than to the breeding of the native stock?—I think they will migrate, but they are certainly breeding at a great rate just now.

Robert McMillan, Holms of Dalquhairn, examined.

Mr R. McMillan.

1827. (*Chairman.*) Your father is tenant of the farm of Holms of Dalquhairn?—He is the proprietor, and farms the land.

1828. Are you well acquainted with the district?—Yes.

1829. Are you suffering from the present infliction?—Yes, since the spring of 1891 we have had them.

1830. Have you suffered much?—We have suffered a good deal.

1831. In regard to the stock?—We are about 11 score of lambs short this year compared with last year, and perhaps nine score short of the average for five years.

1832. What is the average total lamb crop?—On the Holms the average is, say, 58 score. This year the crop is 50 score. In the average for five years is included 1888, which was a bad year owing to the bad spring.

Mr. R. McMillan.

23 June 1892.

1833. Do you attribute this falling off in your lamb crop entirely to the voles?—Yes.

1834. Was this a favourable breeding season for stock? Has it been an average season in respect of weather?—It was a very average year, although the spring was rather late.

1835. Did you have to hand-feed?—On the farms of Carlae and Manquhill we had, but not on the Holms. One of the other two farms I have mentioned has Cheviot sheep and the other black-faced sheep, we had to hand-feed 20 score on one of these farms.

1836. Do you cut much hay?—Not a great deal, we have a good deal of arable land.

1837. Have you any observations to make generally as to remedies?—I have no suggestion to make about the extermination of the voles. We have always had a good many owls. The river has a lot of rough bushes and willows about it, and there are always a certain number of owls about with us. I call them the brown owl. They have gone to the hills more this year to breed than formerly.

1838. Do they build on the branches or on the ground?—On the low branches and on the ground. This is the first year that they have bred on the hill so much.

1839. (*Professor D'Arcy Thompson.*) Speaking both as a farmer and proprietor, do you think that the tenant farmers are under disabilities with regard to burning?—On some estates they certainly are.

1840. Do you think that you burn a much larger proportion of land than many of them are allowed to do? What proportion of land do you burn in a good season?—In a good season we burn about a fifth of the land, but I cannot say exactly; that is only a guess.

1841. Do you usually burn late in the season?—As soon as it is dry weather before April. In March usually.

1842. Do you never burn later than April?—Yes, I have done so, but not much.

1843. (*Mr. Elliot.*) Is your land heather?—We have no heather at all; it is entirely grass.

1844. Do you approve of burning bog?—Certainly, in a year like this.

1845. In ordinary years?—To a certain extent, but we have done it more than usual this year.

1846. About a fifth of your land you say you burn? That may be over the mark, but I should guess it at that.

1847. Is it bent or bog you burn?—Both.

Mr. J. Murray.

JOHN MURRAY, Over Fingland, Crawford, examined.

1848. (*Chairman.*) You are shepherd on the farm of Fingland?—Yes.

1849. And previously you were shepherd at Longland?—Yes.

1850. How long were you there?—For 27 years.

1851. Are you badly affected by the voles on your ground?—Yes.

1852. When did you first notice them?—In the month of July last year.

1853. Are they still on the increase with you?—Yes.

1854. Have they caused much loss?—Yes.

1855. I suppose your experience is much the same as that of the other witnesses?—Yes.

1856. Have you anything to add to what they have told us?—No, I think, nothing.

1857. Where does Fingland lie?—On the march between Dumfries and Lanark.

1858. There is not such a thing as a weasel there now, is there?—There were plenty there once.

1859. Is the game let?—(No answer).

1860. Is it consistent with your knowledge that there has been a great destruction of weasels and other vermin?—Yes, they killed them all off—that is, killed some and took others away alive.

1861. They trapped them for exportation on your farm?—Yes.

1862. How long ago?—Two years ago.

1863. Have you any means of knowing how many went from the farm?—No, I cannot say how many.

1864. Were there many boxes set down as traps?—I have seen the weasels in the traps, both dead and alive.

1865. Was it the keepers alone who trapped them?—The keepers on the place. A man was put on the place to kill them.

1866. (*Mr. Elliot.*) Where were the weasels sent to?—They were sent abroad to kill the rabbits.

1867. Where to?—I do not know, but that is where they went to.

1868. Do you know what price was got for them?—No.

1869. Can you say how many were trapped?—They took away a good many, for there were plenty on the ground before that. They put five of them into a box together, and they just worried one another to death. They had to put them into separate boxes after that.

1870. Have you liberty to burn your land?—Yes, we have full liberty to burn on the farm.

[*Mr. Carruthers* put in a letter which he had received from Mr. James Milligan, farmer, Hayfield, stating that he was unable to be present, but suggesting that if the Committee wished to see a sample of the damage wrought by voles on a farm they should visit Crawfordmuir.

Mr. W. I. Harkness.

WALTER I. HARKNESS, tenant of Mitchellslacks, Closeburn, examined.

1871. (*Chairman.*) You are the tenant of the farm of Mitchellslacks?—Yes.

1872. Has your land been seriously affected by the voles?—Very.

1873. Since the spring of last year?—Yes, since the spring of 1891.

1874. Have they caused a great loss in the stock?—Yes, a great deal. In 1891 the death-rate was 7½ per cent. This year the death-rate is 24 more than it was last year. The average death-rate for five years previous to 1891 was 4¾ per cent. Our crop of lambs was 65 per cent. this year. Last year we had a very bad season, and the crop of lambs was very short. Still, I am 40 more short this year than I was in 1891. I had in 1891 600 less than I had in 1890, and this year I am 40 short even compared with what I had in 1891.

1875-76. When did the voles appear?—We had no voles on our farm in 1890. They appeared all at once in the month of April 1891, after the snow of March and April. They seemed to come all in a body, but where they came from I do not know.

1877. Had you heard of them before that?—No, but I knew that they had been in the east country in 1875 and 1876.

1878. Was this a favourable spring for lambing had it not been for the voles?—In 1891, of course, when the voles first appeared, their natural enemies were not present to keep them down, and this year we have had a very large increase of vermin—over 80 per cent., I should say, of an increase on what they were in the previous year. In fact, the owls never bred on the place before.

1879. Now, Mr. Harkness, I have asked you twice whether you consider last spring a favourable spring for sheep had it not been for the voles. Will you give me an answer to that?—The spring of this year with us was pretty severe, but there was no storm to do the sheep any great harm, if only they had had the whole ground to work upon. But they had only some two-thirds or one-half of the ground to work upon.

1880. I ask the question again, was last year a favourable spring for the stock if it had not been for the voles?—I have seen better.

1881. Yes, no doubt, but have you seen many worse?—Oh, yes; I have seen three storms in succession. I have seen seasons very much worse for stock. You can feed stock in a storm, but if all the hay and the grass have been eaten up, what are you to do.

1882. (*Professor D'Arcy Thompson.*) When do you say the voles came to the farm?—In 1891. There were none in February, and the ground was covered with snow in March. It was after the snow went away that we saw the traces of them. They came in a body, and it was the sheep, in fact, that indicated their presence, and which drew our attention to the matter.

1883. You say that lambs were 600 short in 1891?—Yes, and they are 640 short this year.

1884. Do you attribute that to the voles?—Yes, I do, because they not only eat up the grass, but they eat up the hay, which is necessary at that time of the year, to give the stock a good milk supply; and the wool, too, they injure, because the loss of wool with us is very heavy.

1885. Do you think that in a month the voles caused all that damage?—Yes. They took all the best of the land. They took all the best of the grass to start with, and from what I have seen I think it is their habit to 'go for' the good grasses first, and then to go to the coarser grasses.

1886. Did you try anything to poison them?—Yes, I tried poison, but they would not have it. They would not accept my hospitality.

1887. What poison did you try?—I tried arsenic with oatmeal, and phosphorus; and I tried lard and oil of rhodium. They accepted the food, but we could not see any dead ones as the result, so we gave that up after three days' trial.

1888. (*Mr. Elliot.*) Did you try any other means?—We tried burning, but we could not burn everything. I asked an extension of the time for burning. Now, I notice the voles have left the burnt land, and have gone on the land which was burned two years ago, and they are damaging it already.

1889. Then do you approve very much of burning?—Yes, because it opens up the land and allows the voles to be seen. They do not get so easily away from the dogs and from their natural enemies when the ground is cleared in this way.

1890. Have you many natural enemies on your place?—Yes, we have 80 per cent. more than we previously had.

1891. Had they been killed down previously?—The owls were never known to breed on the farm before, but they are breeding there now.

1892. (*Chairman.*) Now that is not the question which Mr. Elliot asks. Mr. Elliot asked if the vermin had been killed down previously?—Well, the carrion crows were killed before, but not the hawks.

1893. (*Mr. Elliot.*) And were the weasels killed down before?—I have no knowledge of that.

1894. (*Mr. Gillespie.*) In speaking of the heavy loss of lambs in the spring of 1891, did that loss principally take place during your lambing season?—Yes.

1895. Owing to the scarcity of food, had the ewes no milk and the lambs died?—Yes; and another thing I wish to say is that this year there was a great deal of abortion amongst the sheep, and I attribute it to nothing else than the foul state of the land, owing to the droppings of the voles.

1896. And did that large loss take place during the short time, owing to the ewes having no food?—Exactly, and some of them died in three weeks or a month after having lambs.

JOHN BORLAND, tenant of Auchencairn, Closeburn, examined.

Mr. J. Borland.

1897. (*Chairman.*) You are tenant of the farm of Auchencairn?—Yes.

1898. What is the extent of your farm?—2,200 acres, of which 2,000 acres are hill land.

1899. Have you suffered from the action of the voles?—I have suffered considerably, but owing to the peculiar circumstance that my farm is partly hill and partly grass land, I have been able to counteract the influence of the voles by bringing my ewes in at lambing time. At the same time, I have had a smaller crop of lambs this year than ever before. I attribute that to the best of the hill and bog land having been eaten by the voles. There is nothing else to which I can attribute it.

1900. What is the present state of your stock?—It is pretty good just now. Indeed, the sheep were worse in 1891 than they are to-day. If I may go back a little, I may say that I first observed the voles in my parish near Closeburn Castle, in the heavy grass lands there, which are let as grass parks. That was in the autumn and winter of 1889. During the spring and summer of 1890 I observed them in my own park land, about the meadows and the grass land, and in great quantities on the dry banks up about the house, and also in the woods. At that time I began to observe also that the owls were preying upon them. I could see that by their flitting about.

1901. What kind of owls were they?—I took them to be the ordinary tawny owls.

1902. Were they light coloured or dark?—They were dark, I think. In the winter of 1890, and the spring of 1891, the voles began to appear on the hill land, and caused me very serious damage in 1891. In that year I brought in 300 sheep—I have 800 lambing ewes on the hill farm—to the parks, and fed the park sheep with other food. By that means I prevented a very serious shortness in the lambs, but even then the lamb crop was very short.

1903. And it was some extra expense to you this feeding?—Of course; I had the extra expense of feeding the other sheep. I brought in about 200 of the ewes this year.

1904. Are the voles leaving the ground now?—I think they are. I was round the farm the other day, and had a look about me in view of this inquiry. I could not see any voles on the eastern portion of the hill, but on the western portion they have not entirely left. I should say that some parts of the ground (the good grass ground) is so rough that one could not see the voles. If you cross a surface drain, however, you will find them there sure enough. I think that they are migratory, and when they eat up everything on one portion of ground they go to another. This spring, I see, they have affected the heather. They seem to climb up and bite off the green shoots on the top and eat them afterwards. But they appear to have left the heather now, so far as I can see.

1905. (*Mr. Elliot.*) What did it cost you to feed these sheep?—Well, seeing that it was done entirely or nearly all on my own farm, I cannot give the figure. Of course, my chief loss lay in the curtailment of the food which I required for the park sheep.

1906. (*Mr. Gillespie.*) Did you observe voles in considerable numbers in the grass parks in 1889—were the parks unusually rough then?—Yes, both in 1889 and 1890.

1907. When they were observed on your farm of Auchencairn in 1890 and 1891, were they so prevalent in the grass parks?—I think they were increasing by that time in the grass parks.

1908. You did not make any close observation of them?—I noticed that there was a decrease of the voles in 1890 in the grass parks.

1909. And was there any decrease in the number about the grass parks in 1891?—Certainly there was.

1910. Were the grass parks in 1891 much less rough than they were in the previous time?—Yes, it was a bad time for grass and for selling stock, and hence the parks were unduly stocked.

1911. On the part of the hill land where you recently saw scarcely any voles, had the grass on which they subsisted become exhausted?—There was very little left after the autumn of 1890. They seemed to have taken all the good grass in the spring and summer of 1890.

1912. Do you think, then, that they migrated because the food supply failed?—I think so. We burned extensively. We have practically no restrictions on the estate as to burning.

1913. (*Professor D'Arcy Thompson.*) What amount do you usually burn?—I am entitled by my lease to burn one-tenth. It was very dry during the spring of 1891, and the shepherd set fire to the grass in the morning and it just about burned the whole place.

Mr. J. Paterson.

23 June 1892.

JOHN PATERSON, tenant of Craigshiels, Kirkmichael, Dumfriesshire, examined.

1914. (*Chairman.*) You are tenant of the farm of Craigshiels?—Yes.

1915. How long have you been in the district?—One year past at Whitsuntide.

1916. Where did you previously live?—Two miles from Moffat.

1917. Is your farm infested by the voles?—Yes, very badly.

1918. Were they on it when you took it—were you aware that they were there when you took the farm?—No. You see I took it about four months before I came, or rather between three and four months.

1919. You took it about January 1890, then?—About the beginning of February, I think.

1920. And you did not observe any voles then?—No.

1921. And it was a surprise to you to find them there, I suppose?—It was.

1922. Would you have taken the farm with its stock if you had noticed them?—No, I should not.

1922*a*. What has been the result since you went into the farm?—When I came to the farm they were not on the high lands.

1923. What class of ground is it mostly?—The farm is bog land below. The bog land was then nearly eaten up, but they have left the bog land now and taken to the high land—to the heather and the bent. The high land used to be mown for the cows. There was no land preserved for hay. The shepherd told me last year that it was impossible for anyone to cut any hay on the hill.

1924. What is your prospect of hay this year?—Very little prospect.

1925. Is the stock seriously affected?—Very badly.

1926. In what way?—Well, of 499 ewes 45 are dead, and from the others I have got only 250 lambs.

1927. Have you anything more to state to the Committee?—I have burned as much land as I could really do without, for I think that is a very good thing. It allows the natural enemies of the voles to have a chance when the ground is bare after the burning.

1928. Is the game on the farm let?—Yes.

1929. To whom?—To Mr. Marsland of Glenae. He came weekly from the latter end of March to April 1892. He set pole traps for hawks and owls, and other traps for weasels, and likewise laid down poisoned eggs for crows.

1930. Did you see anything killed?—I found three young owls dead, and three weasels. Two of the weasels were out of the trap, and one was in it. I also saw a number of crows lying dead from the effects of the poisoned eggs.

1931. Did you remonstrate with him?—I went and told him about it.

1932. And what did he say?—I told him that it was not lawful to lay down poison at all, and the gamekeeper replied that he had a right to lay down eggs but not to lay down poisoned meat.

1933. Your remonstrance had no effect, then?—They told me to lift the eggs, if I liked, whereas they should have done it themselves.

1934. But what about the traps?—Well, I generally sprung the traps as I went my rounds.

Mr. J. Park.

JAMES PARK, Shepherd, Knockenshaw, Closeburn, examined.

1935. (*Chairman.*) You are shepherd at Knockenshaw?—Yes.

1936. How long have you been there?—Twelve months last May.

1937. Is the farm in the parish of Closeburn?—Yes.

1938. You found the voles on the ground when you came to the farm?—Yes.

1939. Have they increased since then?—Yes.

1940. Tell us what you know about them; what damage have they done?—The mice have caused a great death-rate among the stock. There is a great difference between 1891 compared with the death-rate of 1890, and between 1892 as compared with 1891.

1941. Has this been a favourable season for stock?—More so than 1891 was. We had a very bad time in 1891. In the month of March we had a storm, and April was very barren all through. We have had barren weather this spring, but not to the same extent. We got the rain earlier.

1942. Then would you term it a bad lambing season?—Yes, the worst that ever I went through.

1943. And you account for that by the action of the mice?—Nothing else that I can see; for the land that is worst has lambed worst, and has a heavier death-rate than the other parts of the land not so much affected by the mice.

1944. What is the state of the stock now?—They are middling, very middling.

1945. Will they improve on account of the grass?—They will not improve very long. They will soon feel the effect of the ravages of the voles when the growth stops.

1946. Did you examine any of the dead sheep?—I did not examine any of the old sheep, but I examined some of the lambs—a good many of them.

1947. Did you notice anything peculiar?—I found in their stomachs a great deal of sand and dirt, which I consider they lifted from the ground, which was soiled by the mice.

1948. Do you think that they were affected by the state of the ground as disturbed by the mice?—Yes; when a lamb commences to eat it lifts what is most easily lifted, and, doing so in this case, it would lift a lot of stuff which it was not able to digest at the beginning of its feeding. I observed that lambs, too, had died of wool that they could not digest. It is not unusual for lambs to pick up wool, but in this case I noticed that the wool had been dirty, for their stomachs had dirt in them.

1949. Did you ever observe that before?—No, I did not.

1950. (*Mr. Elliot.*) How much was your lamb crop short this year?—It was 105 short of last year's crop.

1951. What stock have you?—740 ewes.

1952. Are the ewes in poor condition now?—Yes, both the lambs and ewes are.

1953. There will not be a full clip of wool in that case?—No, I never stripped such hoggs and yeld sheep as I did on 12th June this year.

Mr. J. Wallace.

JAMES WALLACE, tenant of Auchenbrack, examined.

1954. (*Chairman.*) You are tenant of the farm of Auchenbrack?—Yes.

1955. You have known the district for a long time?—I was born there.

1956. And have you ever known anything like the present plague of voles?—Nothing like it. I remember in 1875–76 there were a few voles, but not very many of them.

1957. Has the damage been very great this year?—Yes, indeed. It is only since last fall that we have noticed the voles in any great numbers. We first noticed them in the meadow-land about three years ago. I think they began breeding there, and last fall they began to be very plentiful on the hills.

1958. And are they increasing?—Yes, they were increasing, but they seem to be less now. In the spring

the crows pulled up a great many nests, and they have done a great deal of good by taking the young ones. Water rats are very plentiful with us.

1959. And do you think that the water rats do much harm?—Well, they destroy the land; but they are not so numerous as to do much harm. They do harm to the meadows a bit.

1960. (*Mr. Harting.*) Are there any black ones amongst the water-rats?—Not quite black, but of a dark colour. We just call them water rats. I suppose they are a large kind of vole.

1961. It is said that there is a peculiar black variety of water rat—a rat of a dark colour—found in Dumfriesshire. I want to know whether these rats of which you speak are of that variety?—Yes, that is the kind that the rat-catcher has brought in to me.

1962. And would you not call it black?—No, it is not quite black, but very nearly so. I think it was only last fall that we noticed the voles in any numbers, but I think they were bred from the stock we had previously.

1963. Have the voles destroyed the grass much?—One-sixth of the roots of the grasses on the hill-land has now been eaten up and totally destroyed. I burned a good deal of it, and I think that helps, but the burned land was very much eaten, and the grass is coming away very thin, owing to the destruction wrought by the voles.

1964. (*Chairman.*) Do you cut much hay?—Mostly on the meadows. There is damage done to that, too, but the mice are worse on the hills just now.

1965. Do you cut much hay on the hill?—I do to some extent, but on the parts that I do cut the voles are not so numerous. I may say that I remember hawks and weasels being much more plentiful on the farm of Appin; but I know that they were killed off by the keeper about 15 years ago. Since then they have never been so plentiful. There used to be large hawks too on Appin.

1966. What kind of hawks?—The kestrel, and what we call the "gled" hawks used to build there. But they have disappeared now for some time past.

1967. The buzzard, I suppose, you mean?—I suppose so. I observed, I should state, a tick on the mice, but it was different from the tick that Mr. Fergusson mentioned.

1968. Are they sheep ticks?—No, they are not the same ticks as we get on the sheep.

1969. Are there any more points that you wish to draw attention to?—No, except that I think the voles are breeding rather under the ground and under stones in such places where protection of their enemies has been withdrawn.

1970. Would not burning the ground increase that tendency?—Yes, I think so. There seem to be a good many nests in which there are no young ones. The mice I saw on the particular day I referred to when I walked over the farm rushed off to the underground holes whenever they were disturbed. The mole holes are very much occupied by the mice.

1971. (*Earl of Minto.*) Do you attribute the appearance of the voles to any particular cause?—I think it must be the character of the season that accounts for their great increase. They seem to feed more freely than usual. And perhaps, too, the fact of the weasels being less plentiful has had something to do with it. I do not think that the weasels have been killed at Auchenbrack intentionally, but the keepers sometimes in the rabbit traps take weasels by mistake.

1972. You do not think the decrease in the number of weasels altogether accounts for the plague?—I think that had the weasels been as plentiful as formerly the voles would not have been so numerous.

1973. Have you anything to suggest in the way of a remedy?—I do not think that killing them with dogs would do very much good.

1974. (*Mr. Elliot.*) Have you many moles on the farm?—On the hills we have. I kill them in the fields.

1975. Do you think the moles attack the voles?—No; I think they are rather in favour of the voles (*see* 1970).

1976. (*Mr. Gillespie.*) In the previous plagues of 1875–76 did you make any observations as to the circumstances in which they became numerous?—No, there were very few at that time on my land compared with now.

JAMES SINCLAIR REID, Barr, Sanquhar, examined.

1977. (*Chairman.*) You are tenant of the farm of Barr, Sanquhar?—Yes.

1978. What is the size of the farm?—4,000 acres. But it is divided by a river, and the voles are only numerous on 2,500 acres.

1979. Have you suffered badly from the ravages?—As badly as any place I know in Scotland.

1980. How long have you been infested with the voles?—A year last January we noticed them first increasing very largely.

1981. Have you suffered loss in consequence?—A very heavy loss.

1982. Can you give us any idea of the extent of the loss?—Well, this year I have only 60 lambs for a 100 ewes.

1983. What was your usual average of lambs?—About 90.

1984. That is pretty high, is it not?—I do not think so; 90 would be a fair average.

1985. Have you had any feeding by hand?—I have. On the stock this year I have expended in artificial feeding 100*l.*, and I have removed 20 per cent. of the stock from the ground. This year that was an absolute necessity, because I saw that if I did not do this the effects would be most disastrous. I had an opportunity of getting rid of the land in two years, and I took advantage of the opportunity on account of the voles. I am also the tenant of Arthur's Seat, Edinburgh.

1986. You took that opportunity, you say?—Yes, and gave up the land.

1987. Have you any remarks to make in addition to what you have told us?—One of my shepherds in walking over the land last week threw down a match when lighting his pipe and burned an acre. It was put out before any more was burned. But I wish to add that there is a very large proportion of the ground quite fit to burn at the present time.

1988. Do you recommend burning then?—It has not done any good in killing any of the voles so far as my experience goes, but it takes away the cover from them.

1889. What is the land, heather or grass?—All grass; we have no heather.

1990. (*Professor D'Arcy Thompson.*) Are you much restricted in burning?—No, we have no restriction.

1991. I suppose the shepherds also have lost severely on account of this plague? Are they on the "pack" system on your farm?—No. I may state that one of the shepherds kept count of how many voles he killed in his usual rounds. He killed 370 in three days.

1992. (*Mr. Elliot.*) Is the game let on the land?—No.

1993. What did you say the death-rate was?—The death-rate is 8 per cent. of the stock, but I should say that unless the stock had been heavily fed on artificial food there would have been a death-rate of 30 per cent., and the lamb crop would not have been over 25 per cent. on an average.

1994. Are there many so-called "vermin," on the land—such as hawks and weasels?—There is hardly such a thing to be found.

1995. How do you account for that?—Our farm is a long way from any plantations, and the vermin have been killed down I suppose in recent years.

1996. But you only suppose so?—That is generally conceded. It is almost, I believe, an established fact.

1997. Are there many moles on the farm?—Yes.

1998. And are you killing them?—Yes, we have been.

1999. Do you think they would destroy the voles if they were allowed to remain?—No; not so far as I know.

Mr. G. Henderson.

23 June 1892.

GEORGE HENDERSON, manager of the farm of Kelloeside, Kirkconnel, examined.

2000. (*Chairman.*) You live on the farm of Kirkconnel?—Yes.

2001. What extent of land do you manage?—About 4,600 acres.

2002. Have you suffered severely owing to the ravages of the voles?—Yes; to a very large extent.

2003. You have fared no better than your neighbours?—I think we are worse off than most of them.

2004. Are there any fresh points you wish to bring out, because I suppose you have heard the evidence given to-day?—I may say that about three years ago the mice were very plentiful in the meadows, and I think they have spread just about all over the farm. If the hawks and weasels and owls had been as numerous then as they are now, I have no doubt we should have fewer mice to-day.

2005.—What kind of hawks?—Kestrels especially.

2006. Are they killed down?—When the keepers got the chance, formerly the hawks, including kestrels, were always killed.

2007. But I suppose they are spared now?—Yes, I think so. I have not seen or heard of their having been killed lately, the weasels are caught in traps, and especially in the "flag-traps."

2008. What do you estimate the damage to amount to?—I think 500*l.* would not be over the mark.

2009. How do you make that out?—First of all, the deterioration of the stock at present as compared with what it used to be. The plague has not only affected us in the number of deaths but in the condition of the living stock. It is much worse than what it ought to be.

2010. Making allowance for the fall in prices?—In so far as the markets have fallen, that is not attributable to the voles. But the depreciation of the stock in condition and the short crop of lambs and the heavy death-rate among the ewes—all these things are attributable to this cause.

2011. But are you making allowance for the fall of prices that has taken place in the last few years?—Certainly, I am.

2012. (*Mr. Elliot.*) What is your death-rate among the old sheep?—Fourteen per cent.

2013. And among the lambs?—Our crop of lambs this year is about 24 per cent. short.

2014. (*Mr. Gillespie.*) Are there mice on the farms near to you—how prevalent are they in the parish?—They are mostly on the south side of the water; that is, on the western side of the parish. I should say they were on the south-westerly side chiefly.

2015. But on the east how do they stand?—I believe they are beginning to show on the north and east sides of the parish, but only to the extent they were with us two years ago.

2016. So far as you know they are not on the north side?—There are odd ones there.

2017. And they are not into Ayrshire?—Yes, they are as far west as a few miles of Dallmellington.

2018. And is it only recently that they have gone there?—They were noticed there during the present summer.

2019. (*Chairman.*) What information are you relying upon in saying this?—I am relying upon information I have received from farmers I have met, and have been talking with about the plague.

2020. Do you gather that the voles are prevalent on these farms to the same extent as on the farms beside you, and on your own farm?—Not so severely—but they are beginning to show on these lands too.

Mr. E. Dalziel.

EDWARD DALZIEL, Shepherd, Glenmaddie, examined.

2021. (*Chairman.*) How long have you been at Glenmaddie?—Two years.

2022. Did the voles arrive about the same time as yourself?—Well, we were not far separated.

2023. I suppose both of you went to the farm to make a living?—I suppose so.

2024. Can you tell us anything new about the voles that we have not heard before?—No, nothing new, except that they have increased.

2025. Have they caused much loss to you?—Yes, a considerable loss, and we have been put to much expense besides.

2026. Did you hand-feed your stock?—Yes.

2027. What did you feed them on?—Indian corn, hay, and turnips.

2028. Was that on high ground?—Some of it was. A portion of the farm is arable.

2029. Do you cut hay on the hills?—Yes.

2030. And are there mice on the hay ground—the bog land I mean?—Yes.

2031. Do they affect the yield of hay very much?—Yes, very much.

2032. Will there be less hay than usual this season? Yes, very much less.

2033. What state is your stock in just now?—I consider it in a very bad state. The lambs are poor, and there are few of them. Every third lamb is not worth much for selling.

2034. And would you reckon this a good lambing season if it had not been for the voles?—I should say it was an average lambing season if the ground had been in a proper state for pasturing.

2035. (*Earl of Minto.*) Is the shooting let where you are?—No.

2036. There is no shooting tenant then?—No.

2037. So that the vermin have not been killed down by the keepers?—Well, I expect they have been killed.

2038. Are there any keepers?—Yes, there are keepers.

2039. Whose land is it?—It is the Duke of Buccleuch's.

2040. Have you noticed any great diminution in the number of vermin?—Yes, weasels are much less numerous now than they were at one time.

2041. (*Chairman.*) What time are you speaking of now? You have only been there for two years you know?—Yes, I have only been two years on the farm, but I was on a neighbouring farm for nine years before that.

Mr. J. Bell.

JOHN BELL, Gamekeeper to the Duke of Buccleuch at Drumlanrig, examined.

2042. (*Chairman.*) Are you the head keeper to the Duke of Buccleuch at Drumlanrig?—Yes.

2043. How long have you been there?—Four years.

2044. Had you occasion to observe the increase of voles?—Yes.

2045. Now state what the result has been generally?—My attention was first drawn to the great number of voles appearing in this district in the autumn of 189¢, and during that winter and the following summer they were in great numbers in the coverts and low grounds, and they did a lot of mischief to the young trees and the suckers, &c. In the spring of 1891 there were a number of voles in a small field in which we reared our pheasants, and quite close to the copses. But we never detected them in a single instance partaking of the pheasant's food, and it is a well-known fact that other vermin, such as rats and mice, are with difficulty kept from it, thus proving that they are strictly herbivorous and are not easily induced to take

poisoned grain. About the month of February last I noticed that they were rapidly decreasing. I cannot account for this, but nevertheless we have not one for thousands which we had last year. I noticed several lying dead. They did not appear to have come by any violent death. They had just collapsed.

2046. You are speaking about the plantations and the low ground, I understand?—Yes, so that the vole plague has left the low grounds, after lasting for less than two years there. During that time we had a great influx of kestrels, drawn, as I believe, from the hill districts round about, but on the disappearance of the voles they also left us, and they are now very plentiful on the moors.

2047. How do you treat the kestrels?—We have never treated them very hardly.

2048. Have you ever shot them?—Yes, occasionally we have.

2049. But that is hard treatment, is it not?—Well, we do not put them down so hardly as other hawks.

2050. Why do you put them down at all?—They are not so bad on the game as a rule as other hawks, but they do take it, and we have to protect the pheasants in the covers.

2051. Now, I want you to be precise on this point. Have you ever seen a kestrel kill a pheasant?—I have, but we do not treat kestrels like other hawks. We have always been very lenient with them.

2052. Have you ever seen a kestrel kill a young pheasant?—Yes.

2053. Is it a common occurrence?—No.

2054. Have you seen it more than once?—I think twice that I can remember.

2055. In an experience of how many years?—Over 30 years. So far as I remember, I have only seen it twice.

2056. Were these young pheasants in a wild state?—Yes, they were young wild pheasants.

2057. And there can be no mistake that you saw a kestrel at least once, and possibly twice, take a young pheasant?—No. I have also seen one last year lift a young rabbit.

2058. But there would be no great harm in that?—Oh, no.

2059. Now, will you please proceed with your statement?—With regard to the voles on the moors, they are more or less over all the moors on the estate, and on some places they have done a considerable amount of damage to the grass. Their extinction, will, I am afraid, be a difficult matter; only I am hopeful that nature will interfere with their progress on the moors as it has interfered with their progress on the low grounds. We have instructions from his Grace not to kill kestrels and weasels, which instructions of course have been strictly adhered to. We never were very severe on kestrels, and had always a fair stock of them. Owls have always been strictly preserved too. Of them we have a very large number. Weasels are rather scarce, owing to so much rabbit-trapping. Rabbits are to a certain extent over most of our moors, and where they are I do not think that the weasels will trouble themselves much with the voles. The collie seems to be the most useful of dogs for killing voles. I would therefore recommend that permission be granted to every tenant whose land is infested with voles to keep an unlimited number of collies without a license. In the second place I think that permission should be given to burn bent at all times on the places infested. And in the third place I would prohibit the killing of kestrels, owls, and weasels in infested districts, not that they themselves would put down the plague, but they might be the means of keeping the voles in check until such time as climatic or other influences might sweep them away. The rooks are at present doing good work by taking the young voles out of their nests. I have seen a great many nests cleared out by them. Indeed, on moors where rooks have been, I scarcely think a full nest will be found. As the rooks will now be going out with their young broods on the hills, I expect they will do a great amount of good.

2060. Do the rooks do much damage to game by robbing the nests?—Yes.

2061. Did you ever see them attack young birds?—No.

2062. What else have you to state?—With regard to poison, I am afraid it would defeat the object in view, even if the voles could be induced to eat it, as the poisoned voles would probably poison their natural enemies, such as the collies, foxes, cats, weasels, hawks, and owls. As to the evidence that has been given that the plague of field voles is due to the recent extreme killing of hawks, weasels, &c., I may say that there has been no killing of hawks, weasels, &c. recently, and there has been only one important gamekeeper for a few months during the shooting season last year, and I am not aware that he ever employed his time in killing vermin, for he was too busy killing game. On some of the districts most infested, lying at the outside of the estate, I am pretty certain that they have never been much disturbed by anyone killing the vermin there, nor has the ground ever been let. I may also say that every facility has been given with regard to burning for the last two seasons.

2063. You have expressed yourself about the comparative immunity extended to the kestrel hawk. Is there any species of hawk that would destroy the mice and not the game, have you ever seen the sparrow-hawk killing mice?—No.

2064. The merlin hawk?—No.

2065. The buzzard?—Some of my assistants say that they have, but I never saw them myself. We have four buzzards, and my assistants say that they have seen them at the mice. But I should fancy that rabbits are more in their way.

2066. (*Mr. Elliot.*) You have rabbits over the moors?—Yes.

2067. You get weasels sometimes when you are trapping the rabbits?—Yes.

2068. And what about the rabbits?—We should prefer that the weasels should live to keep the rabbits down.

2069. Would the rabbits not get too numerous if the weasels disappeared and trapping was stopped?—The tenants say that they would prefer voles to rabbits.

2070. Who burns the heather?—The gamekeepers in most cases. Last year we gave the tenants a great deal of liberty to burn for themselves without the assistance of our men, and in some cases our men were not present at the burning.

2071. You are the judge of what ought to be burned?—No, that is left to the tenants, and the shepherds, and to the man on the beat.

2072. (*Mr. Gillespie.*) You have said that there has been no extra killing of vermin?—No. Although the killing was pretty severe, it was not extra.

2073. Was there a considerable putting down of vermin?—There would not be a great number of vermin put down, for the place has always been regularly trapped.

2074. Then, until recently, there was very little vermin on the estate?—Yes, considering the size of the estate, the quantity of vermin was very small.

2075. Did you seek to kill weasels intentionally, generally over the estate, by traps and other means, irrespective of those killed in the rabbit traps?—No, not generally over the estate—not in the hilly districts.

2076. (*Mr. Harting.*) You began by referring to the plantations, and you said much damage was done in the plantations by the voles. Are you prepared to say that the voles which did the damage in the plantations are the same as those found on the sheep-farms now?—I think so.

2077. Have you compared the two together?—I never compared them, but I have seen the one in the covers and the other outside, and I think they are the same species.

2078. Are you aware that it is stated that the vole which is on the sheep pastures does not bark trees or do damage in other ways to plantations?—That may be. I think they are the same, but I may be wrong. I am not a naturalist.

2079. Are they not very much alike?—Yes, very much.

2080. Has the damage in the plantations been very great?—No.

Mr. J. Bell.

23 June 1892.

2081. Is it the young trees that are mostly damaged?—Yes, the newly planted trees, and the suckers. They have been damaged from the roots.

2082. Can you forward to the Committee any specimens of bark or saplings which have been damaged by the voles in the plantations?—Yes, I think I could do that.

2083. The Committee would like to see specimens also of the voles which are alleged to do this damage to the plantations. Can you get us a specimen or two?—Yes, I can do that too.

2084. I understand that the damage which they did to the trees was the biting round of the tender bark which is just above the earth?—Yes.

2085. Were the trees damaged as far up as the voles could reach?—Oh, no. You could not see that the tree was damaged till it was dead. They barked the trees round the tender part, which is just about the ground.

2086. At no height from the ground?—No, at no height from the ground.

2087. Then you would say that these voles do not climb?—Well, they climbed the thorn bushes and barked them seven or eight feet up.

2088. Did they bark the trees in the plantations, then, in this way?—No; they were only barked close to the ground.

2089. And how soon was the damage which they did apparent in the tree?—Well, of course there is no more life in a tree if you separate the bark round the soil; it simply decays.

2090. And you discovered the depredators by the decaying of the young trees?—Yes.

2091. Would you say that a very serious loss was thus occasioned?—No; I would say a considerable loss; but nothing very serious.

2092. Did you take any measures in the plantations to get rid of the voles?—We tried pitfalls, but they were not very successful. They were not so numerous that we could catch any great number.

2093. Was that the only method tried?—Yes, that was the only method, so far as I am aware.

Mr. J. Laurie.

JOHN LAURIE, Shepherd, Dalgonar, Sanquhar, examined.

2094. (*Chairman.*) Are you shepherd on the farm of Dalgonar?—Yes.

2095. How long have you known that district?—Since 1818. I have had full charge of a hirsell since 1826.

2096. I presume your attention has been called to the voles; in the course of your experience did you ever know anything like it?—I never saw anything like it before. I have often seen voles on the hills, but never in like numbers to what we have them now.

2097. Has the damage been very great?—Yes, very great.

2098. What is the effect on the stock?—It has suffered greatly, both by deterioration in quality and in respect of the lamb crop being smaller than usual.

2099. Have you incurred much expense in hand-feeding?—Not very much.

2100. Are the voles increasing with you still?—Yes.

2101. Do you cut much hay on the ground?—Yes, generally.

2102. Will there be much to cut this year?—There is no prospect of any hay at all.

2103. (*Earl of Minto.*) Do you see much difference in the amount of vermin—are the weasels plentiful?—I have not seen one this season.

2104. Are they less numerous than they used to be?—Yes.

2105. Have they been killed down?—Not yonder, but in some places they have.

2106. Do you think the killing down of the vermin is the cause of the appearance of the voles?—Perhaps that may have helped to their increase.

2107. Is the shooting let where you are?—No.

2108. Is there any shooting there?—Very little. If desired, I could show you a box full of voles, and could tell you about the quantity of grass they consumed yearly. I can let you see four voles and what they consumed daily for the last six weeks by weight.

2109. (*Chairman.*) We shall be very glad to see them, if you will get them for us.

Mr. J. Borland.

JOHN BORLAND, Auchencairn, recalled and examined.

2110. (*Chairman.*) You wish to give additional evidence, I understand?—Yes, in connection with the destruction of vermin, I have been an observer all my life, and know the district very well, and I knew it as a boy. My farm is partly hill, partly pasture, and partly arable, and is well surrounded with woods. As a boy I remember perfectly well that weasels in particular were very plentiful, and I likewise know that the keepers adopted measures to secure their extermination. They used baited traps, and also iron traps, which were protected from other animals, such as the sheep. I remember quite well that the weasels were very plentiful, and we were not much troubled with rabbits. Since then the rabbits have been on the increase, and the keepers have had to take measures to trap them down. In trapping the rabbits they killed every weasel on the place. I have not seen a weasel on my land for some time. I could not say the length of time it is since I saw one.

2111. I suppose you had a joint right to the rabbits?—I thought I would have a joint right to the rabbits before the passing of the Ground Game Act, but I do not think I have now, when I am prohibited from killing them for seven months in the year.

2112. Is that owing to the land being moorland?—Yes, that is so. For the last ten years we have had an annual plague of rabbits. There is not a single weasel left to prey upon the young broods of rabbits. About the owls, I think in our parish they were very plentiful. As a lad I remember I was very frightened at the eerie cry of the owl at night, and a few years ago I knew that a pair of owls were breeding on the farm, and I asked the gamekeeper to leave one pair of them, but he declined. This Committee has been asked to inquire into the vole plague, but may I point out that for the last ten years, I should say, we have had an annual rabbit plague.

2113. Now, Mr. Borland, we have nothing to do with that?—Two or three years ago we had a rat plague. Our farms were overrun with rats; and now we have a mouse plague.

2114. But do you connect this phenomenon with the diminution in the number of weasels?—I attribute the great increase of the voles to the luxuriant pasture of 1889 and 1890, which gave food and shelter to them, and I should certainly connect the three plagues I have mentioned with the complete extermination of the vermin.

Mr. R. Dalziel.

ROBERT DALZIEL, tenant of Druid Hall and Glenwhargen, examined.

2115. (*Chairman.*) You are tenant of the farm of Druid Hall?—Yes, but Glenwhargen is also affected by the vole plague.

2116. What is the extent of Druid Hall?—About 2,200 acres, I think.

2117. You have heard the evidence of the other witnesses? Does your experience generally correspond to a great extent with theirs?—Yes, to a great extent; but the voles came to our place late. They appeared in December 1891.

2118. Did they come from your neighbours' land?—I do not know whether they came from there, or where they came from.

2119. Did they appear suddenly?—No, you cannot call it suddenly. There was a great increase in their

numbers for a space of three months. The grass was always growing then, and after that there came a "dead" season for the grass, and then they had to feed on what they could get.

2120. Did you suffer much loss?—Yes, a good deal.

2121. Can you estimate it in figures?—Yes, I can give it to you in percentages. I have ten per cent. less lambs and five per cent. more deaths.

2122. And what is the condition of your stock?—I am sure I cannot say what is to be the result for the next winter. We are to have no grass at all so far as appearances go.

2123. But I asked about the condition of the stock at the present time?—The stock are lean and the ewes are short of wool. The crop is certain to be short.

Mr. R. Dalziel.

23 June 1892.

2124. And you do not know how you are to get them through the next winter?—I know perfectly well how to get them through—by relief probably at an expense of 200*l.* or 300*l.*

2125. By hand-feeding?—Yes.

2126. With hay?—With turnips and Indian corn.

2127. Do you cut hay on the high land?—On the low land.

2128. But not on the hill land?—Not on the hill. The hill farm is very rocky.

GEORGE HASTINGS, Shepherd, Glenwhorgen, examined.

Mr. G. Hastings.

2129. (*Chairman.*) You are shepherd on the farm of Glenwhorgen?—Yes.

2130. And you have heard what the previous witness had to say?—Yes; he has said as much as I can say about the matter.

2131. Do you confirm his evidence?—Yes.

WILLIAM ARMSTRONG, Shepherd, Shiel, examined.

Mr. W. Armstrong.

2132. (*Chairman.*) You are a shepherd on the farm of Shiel?—Yes.

2133. How long have you been there?—For 13 years.

2134. You must have gone there very young then?—I am 32 years of age.

2135. Are there many voles with you?—Yes, they are very plentiful.

2136. Have they done much damage?—Yes, very much damage.

2137. Has the death-rate increased?—Yes; we have 5 per cent. fewer lambs this year than we had last year, that is about 20 per cent. fewer than an average lamb crop.

2138. Is there game on the ground?—Yes.

2139. What sort of game?—Grouse and black-game.

2140. Are there many hawks?—Yes, a good many kestrel hawks.

2141. Does anybody interfere with them?—Not this year, but formerly they were destroyed.

2142. They have been preserved this year to tackle the voles, have they?—Yes, I suppose so.

JOHN LAWRIE, a former witness, recalled.

Mr. J. Lawrie.

2143. (*Chairman.*) You have come back to give us an account of an experiment you made with the view of ascertaining how much food a vole eats in a day?—Yes, I put several voles into a box (*box produced*) and I kept a watch on them to see how much they would eat in a day. I put grass into a box beside them, and I found that each vole ate 6 oz. (six ounces) of grass in a day.

THOMAS DALGLIESH, Shepherd, Arkleton, Langholm, examined.

Mr. T. Dalgliesh.

2144. (*Chairman.*) Is your land badly affected. Not yet, but the voles are increasing rapidly.

2145. When did they come?—There was little damage done last summer.

2146. They are increasing, are they?—Rapidly; they are increasing very much.

2147. Are you taking any measures to stop them?—No.

2148. Did you suffer much last year?—No.

2149. (*Mr. Gillespie.*) Where do you live?—At Ewes, Langholm.

2150. Are there many farms affected near you?—Yes, where the land is heavy and the pasture is rough.

2151. Are these farms lower down than you are?—A very little past us.

2152. You are nearly at the most southerly point?—Yes.

2153. When did you notice them first?—Two years ago, when I first went there I noticed them.

2154. And they are worse now?—Yes.

THOMAS R. HADDOW, Merkland, Penpont, examined.

Mr. T. R. Haddow.

2155. (*Chairman.*) When did you come to the district?—I came to reside there about eight years ago.

2156. Have you been suffering from the visitation of voles to a serious extent?—Yes, to much the same extent as some of my neighbours.

2157. What did you estimate the damage at?—That is a very difficult question, and it will not be easy to say what the loss has been till the end of the season, more especially the loss in wool. We shall suffer considerably from the loss on wool with the Cheviot sheep. Besides, I have been feeding very heavily on Indian corn in the spring, and owing to that I have got off easier than some other people. But, at the same time, the ewes and lambs are not of the usual quality, and the death-rate is heavier, too.

2158. Great stress is laid by several witnesses on the preservation of the natural enemies of the voles. Do you think that their destruction has had anything to do with the plague?—In my opinion it is beyond the power of man to do much with the plague. The weasels ought to be left alone, I think. The voles will go as they came; they are of a migratory nature. They have nearly eaten up the district, starting with the bog land, and now they have taken to the grass land.

2159. Have you nothing to suggest as to proposed remedies?—Nothing whatever.

2160. Nothing about traps, or poisons, or dogs; have you tried any of these?—I cannot see much use in dogs in this case.

Mr. J. Forbes.

23 June 1892.

JAMES FORBES, Under Chamberlain to the Duke of Buccleuch at Dabton, examined.

2161. (*Chairman.*) I understand that you wish to make a statement to the Committee?—Yes, I wish to say that recently I have done 30 hours' walking over six or seven different farms in the neighbourhood, to observe the damage done by the voles, and my opinion, from what I have seen, is that they are getting less in numbers on most of the farms. The reason, so far as I could gather, is that the rooks are harrying their nests to a great extent. On three of the farms I visited this was especially the case. One of these farms was Mitchellslacks. Although we searched the tufts of grass on the farms very carefully all over the ground during the whole 30 hours' walking we found very few voles' nests indeed; although we saw a number of half-grown voles running about here and there. The nests that we did find showed that the number in a litter varies from four to six. We found a number of nests of four, of five, and of six. Most of these farmers, at least with the exception of one, did not seem to ascribe the plague of voles to the destruction of their natural enemies at all. They thought that the mild seasons were to blame for it.

2162. We want your own evidence, not hearsay?—Well, it is my opinion that the mild seasons have brought about the plague, and that the natural enemies have not so much to do with it. No doubt, if there were more of the natural enemies it would help to keep the voles down, but I think the plague would have come about even if the vermin had been much more numerous than they are now.

2163. Do you think, then, that the whole damage is as serious as we have been led to believe?—Some of the farms are seriously damaged; in the case of others the damage is not so serious, but it would be invidious to name them.

2164. Can you name them?—Yes, I can, and I am prepared to do so if the Committee wish it.

2165. Well?—Mitchellslacks I consider to be seriously damaged. Clenries is not so badly affected, and neither are Merkland, Chanlockfoot, or Glenmaddie. The other farm that I visited was Drumbuie. Certainly a great deal of the bog land has been eaten, but I think the loss is not altogether due to the voles, but to the bad weather we had last year. At the back end of the year there was very little grass, and there was almost no growth, and this last spring was very cold and barren.

2166. Do you mean that the bog land is not damaged on these farms by the mice?—Of course it is affected, but the damage done as yet is not so very great, with the exception of Mitchellslacks. It has been felt, no doubt, but at the present time there is plenty of grass. There was less earlier in the year than there would have been had we had a decent season last year. I think the bareness of the grass last spring has helped to account for the scarcity of milk in the gimmers, and I think that the short lamb crop is as much due to natural causes as to the action of the mice.

2167. Do you think that, apart from the visitation of the voles, last spring was below the average as a lambing season?—Yes, I think so.

2168. (*Professor D'Arcy Thompson.*) You distinctly think that last year was a bad season for lambing, so far as weather and growth of grass were concerned?—Yes, I think so.

2169. Bad enough to leave impressions in the present spring?—Yes, the grass.

2170. And bad apart from the presence of voles, then?—Yes.

2171. (*Mr. Elliot.*) I thought you ascribed the great number of voles to the good seasons we had had for the last two years—to these mild seasons, as you said?—Yes.

2172. And yet you say that last season was one of the worst—that is the season when the great increase of voles was noticed?—Last year's season was very bad, but the plague came about owing to the mild, open seasons.

2173. It came in the spring of 1891 on many farms, according to the evidence?—Well, last season was a very bad season. There was a very bad back end, and a very bad grass this spring.

2174. How many voles do you estimate the rooks you spoke about would kill on each farm?—It is difficult to give an estimate. I am judging from the number of harried nests I saw. I think there the birds have cleared the nests we noticed. The tenants were with me, and we noticed many nests harried all over the place. I think a good many would be harried by kestrels. There was a young kestrel in one nest we came upon, and we saw many pellets lying about, indicating that the kestrels had been preying upon voles.

2175. Is it your opinion that only one farm in the neighbourhood has been damaged by the voles?—Oh, no, not by any means. I have been over some of the farms.

2176. On which no damage was done?—There are some farms on which much damage has been done, and there are other farms where the damage has not been serious. I said I had been over a number of farms, and that only one of them was very considerably damaged. The others were not damaged to the same extent.

2177. (*Chairman.*) The question, in effect, was whether you considered the evidence laid before us as to the damage done by the voles has been exaggerated or not?—Well, my own opinion is that it is exaggerated a bit. The tenants and other witnesses seem to ascribe the entire loss of lambs and the depreciation of the stock this year to the presence of the voles. Now, I do not think that that is right.

2178. (*Mr. Gillespie.*) How many farms have you inspected?—Those I have already named, viz., Mitchellslacks, Chanlockfoot, Glenmaddie, Merkland, Drumbuie, and Clenries.

2179. And you say that on four of them not much damage has been done?—It is not so serious there as in the other case.

2180. Are you aware that regarding three of these four farms where you say the damage has not been so great, there has been no evidence laid before the Commission? Are you aware that of the six farms you have inspected, three of them are in this position, that no evidence about them has been tendered to us?—I admit that. I have only given evidence so far as I have been able to get it up to the present time.

2181. And are you aware that in the case of Merkland Mr. Haddow did not represent the damage as so extreme as in some of the other districts?—Yes, that is right.

2182. You have not been over these farms on which the damage is said to be extreme?—No, not yet.

2183. When did you begin to inspect the farms you have mentioned having walked over?—Only about 10 or 12 days ago.

2184. You are aware, I presume, that there has been quite a phenomenal growth of grass previous to the last 10 days?—Yes, I am aware of that.

2185. And that much of the effect—that is, the visible effect—produced on certain classes of land by the voles has been removed by the growth of grass previous to the time you began to inspect?—Yes.

2186. So that you will admit that you are scarcely in a position to judge the matter so well as if you had examined the farms at the end of last year or during the winter?—I admit that the damage would have appeared much worse if I had visited them sooner.

2187. You said something about the growth of grass last year, and you also said that you thought that it had been a bad lambing season?—I said of my own personal knowledge that last spring was a bad lambing spring.

2188. You are aware that the weather was good during the lambing time?—Yes, but it was very cold, and there was a great scarcity of grass apart from the destruction caused by the voles.

2189. Was there a heavy death-rate of lambs all over the country so far as you know?—Yes, there was.

2190. (*Chairman.*) You are in Mr. Dickson's office, I think?—Yes, I am, as assistant.

2190*a*. How long have you been in his office?—I have been there for nearly 15 years.

2191. Do you come before us to-day at his request?—Yes, I was asked by his Grace to be present here to-day, Mr. Dickson being from home just now.

2192. I understand you attribute the death-rate of lambs this year and the increased death-rate amongst

the ewes to the shortness of the grass last autumn?—Yes, partly.

2193. Do you attribute the death-rate in the spring of 1891 to the same cause?—No, I would not. I cannot speak so positively of 1891 at all.

2194. Now, is it not well known that the back end of 1890 was distinguished by a very plentiful growth of grass?—Yes.

2195. Therefore, the increased death-rate in the spring of 1891 must have been owing to some additional cause?—It must have been.

2196. In both cases the increased death-rate has been attributed by the tenants to the destruction of the pastures by the voles. Do you know that?—Yes. But I do not think that the bad lambing of 1891 is ascribed to the voles, in this district at all events. In fact, the voles were first noticed in this district on the farm of Mitchellslacks, and that was in March or April last year.

2197. (*Chairman.*) You have been in the room to-day, and you have heard the tenants themselves attribute their losses in 1891 to the voles on the ground?—Yes, that may have been the cause in one or two cases, but on most of the farms I have been over the voles were not there till later in the season—until, in fact, after the lambing time.

2198. (*Mr. Elliot.*) I wish to ask whether you have any practical knowledge of the farming of hill land?—No, I have never farmed on hill land. I was brought up on an arable farm, and for 10 years I have gone about this estate, but I have not been going about without observing the management of the stock and the state of the stock over the country.

2199. (*Chairman.*) There is one more question I wish to ask you. You have given evidence here on a point of great importance. We have received the evidence of between 70 and 80 witnesses, and I must say that they have borne testimony to the fact that last spring would have been fully an average season had it not been for the presence of the voles. You are the only witness who has come before the Committee and has told us that, in your opinion, it was a bad lambing season. I ask you now, are you able to produce any practical farmer who can confirm that opinion?—Yes; I am perfectly prepared to do so now, Mr. Hyslop, Clenries, was in the room a moment ago, and he can give evidence on the same point.

WILLIAM HYSLOP, tenant of Clenries farm, examined.

2200. (*Chairman.*) We wish to ask you a question as to the character of the seasons. Would you say that last spring was a favourable season for lambing as regards weather?—No.

2201. For what reason would you say that?—Owing to the bad weather. It was not good weather.

2202. Would you say that the season was below the average in point of weather?—Yes.

2203. What kind of weather was it?—Cold and dry, and sometimes a good deal of snow.

2204. (*Professor D'Arcy Thompson.*) Are you speaking of the spring of 1892 or the spring of 1891?—I am speaking of this year—1892.

2205. (*Mr. Elliot.*) Is dry weather not an advantage for a lambing season in your country?—It is sometimes.

2206. Not at all times?—No.

2207. You say this year was below the average in point of weather?—We had good weather and we had bad weather; but altogether we had not very good weather to get through with our lambing season.

2208. Were these conditions general over the district?—I cannot say that. I can only speak for myself.

2209. But is there not something exceptional about your farm, owing to its being close to the lead mines? How does that affect your place?—It affects me in a certain way, but I do not know that I need go into that here.

2210. Well, in what kind of weather are you most affected?—It affects me worse in a dry season than in a wet one.

2211. What sort of lambing time was 1886 and 1887?—It was a very sore time indeed.

2212. When you say this year was a bad lambing season, do you attribute that to the fact of your being near the mines, and to the dry weather?—No, I do not. There is only a certain portion of my farm affected by the mines.

2213. (*Mr. Gillespie.*) From the time that lambs began to drop this year, would you consider it a bad lambing season as regards weather? As a matter of fact was not the weather fairly good and dry on the whole, and fairly good during the whole actual lambing time this season?—Yes, it was fairly good.

2214. Is it not the case that the evil arose considerably from a previous scarcity of food? Were the ewes not rather short of milk?—I had to use a good deal of artificial food this season.

2215. Is it not consistent with your knowledge that there was a fair average crop of lambs lived over the country, apart from the land affected by the plague?—There might be, but I cannot say as to that. I only speak from my own experience.

(The Committee adjourned *sine die.*)

APPENDICES.

APPENDIX I.

Appendix I.

REPORT ON THE PLAGUE OF FIELD MICE OR VOLES IN THE SOUTH OF SCOTLAND.

To the President of the Board of Agriculture.

Sir,

I have the honour to submit the accompanying reports and statements respecting an extensive destruction of young grass and herbage on the hill grazings and rough pastures of the South of Scotland, which has been caused by the unusual prevalence of field mice.

Various complaints on this subject reached this Department during the past winter, and these were corroborated by a formal resolution forwarded by the Highland and Agricultural Society of Scotland, on the 20th January 1892, asking the Board of Agriculture to undertake an investigation into the circumstances and causes of the plague, with a view of ascertaining what preventives and remedies might be employed.

Instructions were accordingly issued to local inspectors of the Board to make inquiry into the matter. The reports of these gentlemen supply a sufficient body of information to indicate the very serious extent of the mischief which has been effected.

The inquiry, so far as concerned the counties of Kirkcudbright, Dumfries, and Roxburgh, was entrusted to Mr. R. F. Dudgeon, of the Grange, Kirkcudbright, and with regard to the remaining counties affected, viz., Selkirk, Peebles, and Lanark, to Mr. James I. Davidson, of Saughton Mains, Edinburgh, Inspectors of the Board under the Land Drainage and Improvement Acts. The aim of the investigations was to learn the extent and circumstances of the plague, the areas and classes of pasture specially affected, and the steps suggested by present experience or by the remembrance of former attacks, either as preventive or as remedial measures.

The inspectors report the plague to be especially serious along the northern boundary of Dumfriesshire, east of Thornhill, and in the north-west of Roxburgh, while the border districts in the south of Selkirk, Peebles, and Lanark, and the parishes of Carsphairn and Dalry, in the extreme north of the stewartry of Kirkcudbright, are also reported to be more or less affected. In Roxburgh and Dumfries the plague is estimated to have extended over an area of from 80,000 to 90,000 acres.

The so-called field mouse or, more properly, field vole which has thus proved so destructive to the pastures is recognised as the *Arvicola agrestis*. This pest was observed to be more than usually numerous in the autumn and winter of 1890, and to multiply rapidly in the following spring and summer. The mice apparently first attacked the boggy and rough pasture lands, and as the latter became foul or exhausted the attack spread to the barer lea land and even to the heather. Damage to young trees in enclosed plantations has also been reported, but this may probably be attributed to the attacks of another vole—the *A. glareolus* or bank vole.

Sheep are reported to be suffering severely in the districts affected, and large portions of many flocks have been removed to winterage, wherever that can be found. Hay and artificial foods are necessarily being used for feeding stock on many hirsels. Arable land is, it is stated, not appreciably affected, but fears are entertained that the seed corn may be attacked, especially in low lands where the mice can work their way up the furrows.

A preponderance of opinion amongst farmers is reported tracing the cause of the present outbreak to the scarcity of owls, kestrels, hawks, weasels, and other vermin. All these animals are to be ranged among the natural enemies of the mice, and even crows may be placed in the same category. A climatic cause of very considerable importance is also pointed out, in the fact that the peculiarly luxuriant hill growth in the winter of 1890–91, coupled with the mildness of that season in Scotland, afforded the voles unusual advantages in the shape of shelter from their natural enemies, and favoured their increase.

Pits or traps, such as are resorted to on the Continent, are reported to have proved of but little use as remedies on this occasion, and although thousands of voles have been killed by men with spades and dogs, this method can only be of limited avail under the circumstances. The inspectors concur in representing that, in the absence of a natural remedy, the general feeling favours the burning of the affected ground, as offering a more effective means of possibly exterminating the pest.

The greater portion of the area affected by the present outbreak, and also some parts of the north of England, suffered from a somewhat similar visitation in the winter of 1875–6. This was likewise ascribed to the destruction of the natural enemies of the vole and to the succession of mild winters immediately preceding that of 1875–6.

Inquiries into more distant records show that both the southern and eastern counties of England have been, at different dates in the 16th, 17th, and 18th centuries, no strangers to an occasional plague of this description. In 1814 there were loud complaints of the injuries caused by the voles in both the New Forest and the Forest of Dean, and again in the latter district in 1836, although some of the attacks attributed to the *Arvicola agrestis* may, it is believed, have been caused by a longer-tailed variety, the *Mus sylvaticus*.

In France, in Holland, in Germany, and in Austria large areas of corn and pasture land have been more or less devastated at various periods by the pest now complained of. Various expedients are said, in the records of former attacks, both in this and other countries, to have been resorted to for the extermination of voles. The hole-trap was employed both in the New Forest in 1814 and abroad with some success. This trap is made by digging holes wider at the bottom than at the top, into which the mice fall, and, being unable to get out, are easily killed. Sometimes a jar or pot filled with water has been placed at the bottom of the hole, but this can be effective only in small and circumscribed outbreaks.

In the autumn of 1890 voles were particularly troublesome in some parts of Germany. Stress was laid in an article in the *Deutsche Landwirthschaftliche Presse* of April 18, 1891, on the necessity of taking such steps as may be feasible for the extermination of the pests in the early spring. The closing of the holes with the hoe, or blocking them with turf when the fields are soddened with rain water has been recommended in Germany. Every pair of mice destroyed in the early spring no doubt will save a severe struggle with numbers of young mice in the later months of the year.

The extreme difficulty of employing any of those modes of dealing with the plague under the circumstances now prevalent in the hill grazings of the Scotch counties above named will, however, be readily recognised by a perusal of the accompanying reports. From their general tone, as well as from the latest information received by this Department, it would seem that relief must be mainly hoped for from natural causes. The more recent snowstorms are, however, reported to have so far failed in extirpating the vermin, which have been found alive in large numbers under snowdrifts.

To the reports of the inspectors I have appended the text of the series of letters received by the Highland and Agricultural Society of Scotland on this subject, which have been transmitted by that Society for the information of the Board of Agriculture.

I have the honour to be,
Sir,
Your most obedient servant,
P. G. Craigie,
Director of the
Intelligence Department.

Board of Agriculture,
March 1892.

Reports of Inspectors.

No. I.—Mr. R. F. Dudgeon's Report upon the Plague of Field Mice or Voles in the Counties of Roxburgh and Dumfries and the Stewartry of Kirkcudbright.

From replies to circulars addressed to 30 or 40 landlords, factors, and tenant farmers in the above counties, I am able to report as follows :—

Roxburgh.

The districts of this county affected by the plague are the west and south-west portions of Teviotdale adjoining the counties of Selkirk and Dumfries, and the south-west portion of Liddesdale. The gross area of the farms seriously affected may be stated as between 30,000 and 40,000 acres.

The voles, although more or less numerous than usual for the previous two years, multiplied to an alarming extent during the spring and summer of 1891. A correspondent in Teviotdale describes them as now "swarming in millions." They apparently first attack the deeper boggy and rough pasture lands, which are destroyed to the extent of nearly four-fifths* of their area; one half of the area of the hill farms in the districts named may be said to be in bog or rough pasture, and I think that I should not be far wrong in stating that some 12,000 to 15,000 acres have been rendered entirely useless by reason of the plague. As the bog or rough pasture becomes foul or exhausted, the voles spread to the barer lea land, and even to the heather, which they bark, at the same time biting off the young shoots. The grasses are first attacked close to the surface of the ground, and the stalk is consumed as far as it continues white or succulent; young shoots are also nipped off; grass tufts are to be seen completely eaten through, what is left by the voles being absolutely valueless. Sheep are suffering severely in the districts affected; large portions of many flocks have been removed to winterage, wherever that can be found, artificial food and purchased hay is being given to the stock on many hirsels; the lightness of last year's hay crop and the present high price of purchased fodder, cakes, and corn adds very considerably to the difficulties of the farmers. Plantations are in some instances attacked, buds being nipped off, and bark peeled. The arable land attached to some of the farms is not appreciably affected, although I am informed by one of my correspondents that during the leading of his corn last autumn voles were discovered under nearly every stook, nests were also found, as well as eaten corn; fears are entertained that the seed corn may be attacked, especially in lea land, where the voles can work their way up the furrows.

There appears to be no increase of the plague at present, indeed some of my correspondents testify to an actual diminution; all, however, agree that this is not the breeding season; were such favourable, the prospects for next summer are appalling. Even should the plague be at once exterminated I fear the summer grazing on many farms must be very poor. It has been observed by a correspondent who has given great attention to the subject that "Deep snowstorms, "especially in the spring months, undoubtedly favour "the production of the pest, more than a winter of "open fresh weather; this may be accounted for by "the perfect protection the covering of snow affords "from the natural enemies of the vole, and to the "vigilance of those enemies being directed elsewhere "for food supplies."

The cause of the plague is almost universally held to be the destruction of the natural enemies of the voles—hawks, owls, weasels, &c.—and it has been remarked that, where plantations are present, affording roosting for birds of prey, the districts in their vicinity are less seriously affected. The gentleman above alluded to as having observed the effect of snowstorms, remarks in this connexion: "During the outbreak of the mice "plague in 1875, under the large trees in some of the "dense woods in Upper Teviotdale, where the owls "roosted during the day, large accumulations of the "droppings of those birds, consisting of the fur and "half-digested skins of the mice, were seen on every "hand." Complaints are also made of the restrictions regarding moor-burning. I learn that on one farm upon the patches burnt last year and the year before there is not a hole nor a vole to be seen; it would appear in this case that the vermin had no chance upon the bare ground against their natural enemies. A correspondent, with, I think, sufficient reason, directs attention to the unusual roughness of the pasture in the autumn and winter of 1890, whereby the voles were afforded obscurity from their enemies and unwonted facilities for breeding. The unusual mildness of the spring of 1891 must also have been very favourable to the protection of the vole.

Various means have been attempted to destroy the vermin; pits and trenches dug and traps set where the voles are most abundant have been found useless. Several farmers have carried out organised raids with men provided with spades (sticks being worthless for purposes of destruction) and accompanied by dogs, and although thousands of voles have been killed in this way, little appreciable difference in the numbers seen is said to be noticeable. Burning seems comparatively effective, especially where a mass of the voles can be surrounded, and the patches of ground set fire to on several sides simultaneously. The common crow has been observed in summer to pick out the nests and destroy the young.

* Another communication from the inspector states that even a larger proportion than this has been totally destroyed.

Dumfries.

There may be said to be three separate districts affected with the plague in Dumfriesshire: (1.) In the north-east portion of the county, in the parish of Eskdalemuir, and the upper portion of the parish of Westerkirk, it is very general; I should say some 20,000 acres are here more or less seriously affected. (2.) In the upper portion of Annandale in the neighbourhood of Moffat, more especially on its western side, nearly every hill farm is suffering from the plague. The area affected in this district I put at 12,000 to 15,000 acres. (3.) In a third area, extending from Queensberry Hill on the east to the vicinity of Thornhill on the west, about 15,000 acres are infested.

The report I have already made in relation to the circumstances of the plague, its cause, and suggestions for the destruction of the voles, under the heading "Roxburgh," applies in every particular to Dumfriesshire. The boggy land is almost totally destroyed, sheep are being removed from many hirsels, and hand feeding at great expense is being resorted to. Unlike Roxburghshire, the plague does not appear to have visited Dumfriesshire, except in one parish on the Roxburgh border, in 1875. The voles are reported, it is worthy of note, in the summer of 1889 to have infested in enormous quantities the low-lying pastures in the vicinity of Closeburn, to have remained during 1890, and to have disappeared, probably migrating to the neighbouring hills, where they now abound, in 1891. The grass, I may mention, in the pasture fields was unusually abundant during the summers 1889 and 1890, and when eaten bare in 1891 the vermin disappeared; this fact apparently confirms the opinion I have already alluded, to that there is a traceable connexion between abundant growth of grass and abnormal increase of voles.

Kirkcudbright.

The plague only seriously affects a district in the extreme north of the stewartry, the hill farms in the parish of Carsphairn are very generally affected, and the voles have quite lately made their appearance in the adjoining parish of Dalry. I should say that some 10,000 to 12,000 acres in the stewartry are infested by the plague. In a parish in the centre of the stewartry complaints are made of voles attacking plantations situated in enclosed land, this vole, however, has been declared by an expert to be the bank vole, a different species to the field vole found elsewhere.

The voles were first noticed in August 1890, since when they have increased enormously. As in the other counties, their principal "habitat" is the boggy land, but they are to be found on all the grass area, and at any altitude.

My remarks already expressed relating to the circumstances of the plague, its cause, and proposed remedial or preventive measures apply with equal force to Kirkcudbright. The suddenness of the plague, and the alarming rapidity of its increase, is the subject of general comment. A shepherd reports that he has carefully examined the burrows, and while the majority range from 6 to 14 inches deep he has found them as deep as 25 inches; in no case did he find signs of a resting place inside a burrow, and he is of opinion that, at this season of the year at any rate, the voles do not go underground, but make their resting places in nests upon the surface.

Appendix I.

There is a general complaint of the increase of moles and rats over the whole stewartry.

I regret that I find it impossible to offer any very practical suggestions as to the means to be adopted with a view either to the destruction of the plague, or to its prevention in the future. Raids upon the most infected spots, with dogs and men armed with spades, used both for the purpose of digging up the burrows and crushing the voles, cannot fail to have some effect in diminishing the numbers. Something might be effected by the extension of the period when moor-burning is permitted, or even in the presence of the plague burning small patches of affected ground might be allowed at all seasons under proper supervision, and with requisite permission from some properly constituted neutral authority. Restrictions upon the destruction of birds of the hawk tribe—which might be protected by their inclusion in the scheduled list of the Wild Birds Protection Act, 1880—and of the stoat and weasel seem advisable. Plantations where the birds of prey might roost in the vicinity of hill pastures would appear worthy of recommendation.

As regards the immediate cause of the present outbreak of the plague, I am inclined to lay considerable stress upon the fact of the unusual "roughness" of pastures in the winter 1890–1891, and to the mildness of the weather at that time, whereby the voles, always more or less present, gained an extraordinary advantage in the shape of shelter from their natural enemies, and in facilities for breeding. In Fleming's "Natural History," an old but excellent authority, the vole is described as an animal "known to multiply prodigiously in certain seasons." The suddenness of the appearance of the plague seems undoubtedly to point to some climatic cause, and the previous outbreak in Roxburgh in 1875, when, by the way, the plague was neither so extensive, nor did it so rapidly increase, was preceded by somewhat similar climatic circumstances. The suddenness of the departure of the plague of 16 years ago leads one to hope that a similar sudden relief may be experienced at present; according to general report, the plague of 1875 disappeared immediately after a snowstorm in the spring of 1876, followed by a "rough thaw," when the half-melted snow was frozen into a "plate," sealing everything up. One dares, however, hardly hope for the cessation of the plague by means of such a cure, which in all probability would create as much havoc among sheep as among voles, especially when the sheep are, as in the affected districts they cannot fail to be, in an abnormally poor condition. Should relief in some shape or other not soon appear, the prospects of the farmers whose pastures have suffered from the plague are dismal in the extreme.

ROBERT F. DUDGEON.

The Grange, Kirkcudbright,
9th February 1892.

No. II.—Mr. JAMES INGLIS DAVIDSON'S REPORT on the PLAGUE of FIELD MICE or VOLES at present affecting certain districts in the Counties of SELKIRK, PEEBLES, and LANARK.

I have the honour to report that, in accordance with instructions contained in your letter of 23th ultimo, I have made extensive inquiries as to the plague of voles which at present infests certain districts in the counties of Selkirk, Peebles, and Lanark, and, having visited and inspected typical cases of damage in each of these counties, I have to report as follows:—

This plague seems to have first made itself felt in the higher districts of Selkirkshire, which is the most seriously affected of the counties visited.

Voles are stated to be always present on the hill pastures, but they began to show signs of increase in 1890, and in the spring of 1891 are reported to have appeared in alarming numbers.

The southern half of Selkirkshire, including the whole of the parish of Ettrick and a considerable part of Yarrow, is now reported to be more or less seriously affected, and the present tendency of the voles seems to be to spread northwards and westwards.

In Peebleshire a number of farms in the parish of Tweedsmuir are more or less affected, but, so far as my inquiries prove, the voles did not appear there in exceptional numbers until the spring of last year.

About the same time they also appeared in the Upper Ward of Lanarkshire, on a number of hill farms in the parish of Crawford on both sides of Clyde, where they have increased very rapidly, and done material damage.

Universal testimony points to bog land as the class of pasture first and most seriously affected, and as its value for winter and spring food on the otherwise "white" or grassy farms in these districts is very great, the temporary destruction of the bog land is naturally looked upon with great apprehension by the hill farmers.

Their depredations are, however, not confined to this class of pasture, as both benty and the shorter and sweeter grasses, locally termed "lea ground," are in many cases considerably damaged, while it is now reported that heather, which has hitherto escaped their attacks, is also being affected.

So far as my own observations have gone, however, their attacks on hard and heathery land have not been serious, nor are they likely to be so, so long as a supply of damp and boggy ground is available.

Opinions differ widely as to the cause of the present outbreak.

Among farmers there is a considerable preponderance of opinion in favour of the view that the destruction of hawks, owls, and weasels, and the consequent disturbance of the balance of nature, are mainly accountable for it.

On the other hand, it is affirmed that the natural enemies of the voles have not, in recent years, been more extensively destroyed than has always been the case, and that recent mild winters and growthy summers have chiefly contributed to the present state of matters.

As regards remedial measures, numerous suggestions have been made, but so far as I have been able to ascertain none has been very efficient, though large numbers of voles are reported to have been destroyed by men and dogs.

While there is little doubt that considerable numbers can be killed in this way, it seems to be fairly evident from the numerous burrows in which the mice secrete themselves, and the runs through which they so alertly escape to them, that anything like total extermination by this means is improbable.

I have, however, been informed from two sources, that by placing small "cocks" of hay or other fodder here and there over the affected ground, on wooden rods, which serve as bearers for their removal to other places, large numbers immediately betake themselves to these for purposes of shelter, and their destruction is thus greatly facilitated on the removal of the "cocks."

Pits dug in the line of their runs, wider at the bottom than at top, have also been suggested, and are reported, where tried on a small scale, to have been fairly effective.

On the other hand, I have been informed that, where tried on open land, they have proved inefficient, but I have not had any opportunity of judging of this for myself.

I believe that experiments are at present being made with the view of poisoning the voles in enclosed places, but I have not yet learned with what degree of success.

Traps, so far as I have been informed, are of no use for the purpose.

So far as I have been able to ascertain, the general feeling among practical men appears to be that, in the absence of nature coming to aid in the extermination of this pest, extensive burning of the affected ground is the most likely method of compassing their destruction.

There are, of course, practical difficulties in the way of applying this remedy to an unlimited extent, as, apart from restrictions in leases affecting the question, it is imperative that sufficient herbage should be preserved for the maintenance of the stocks during the trying spring season, which has yet to be faced, but the propriety of applying this remedy as far as practicable is generally admitted.

With this view it has been proposed that the statutory period available for such purposes should be extended, so that not only would the chances of more favourable weather for effective burning be increased, but the period during which the sheep would be denied the use of the burnt ground would be shortened, in respect that the season of growth would be nearer at hand.

It is to be pointed out that the effect of the depredations already committed by the mice must somewhat militate against the chance of effective burning, as over large areas of the affected ground the herbage lies sodden and saturated on its surface, in consequence of the severance of the stalks from the roots. The sheep drains, too, have been in many places choked by the severed herbage which has fallen into them.

This makes the desirability of extending the burning season till a drier period of the year all the more obvious.

Suggestions have been made that where bog land is not of a nature suitable for burning, it might be occasionally cut, to remove accumulations of decayed vegetation, in which the voles are wont to harbour, though some practical authorities dispute the propriety of burning or otherwise interfering with bog land at all, but affirm that burning should be restricted to the benty ground.

It has been suggested that the areas burned should be kindled on all sides simultaneously, so that the vermin should escape less readily, and if this were followed up by active measures with men and dogs on the unburnt areas to which those escaping would doubtless betake themselves, a very material reduction in their numbers would probably be effected.

On the occasion of a previous outbreak—about 15 years ago—it is alleged that the voles succumbed to natural causes, and disappeared suddenly after a severe frost following a heavy storm of rain and sleet.

My information is that the extent of country then affected was much more limited than on the present occasion, but the foregoing testimony as to the disappearance of the plague is uniformly accepted in these districts.

The letters published by the Highland and Agricultural Society of Scotland will convey to the Board more forcibly than I can state it the serious character of the present outbreak, and the severe loss and inconvenience which stock owners in these districts are at present subjected to, which must be felt all the more keenly under present circumstances, when returns from hill farms are materially lessened from the lower values of sheep stocks, and when prices of hay and other fodder, which it has been found necessary to substitute on many holdings, are at present higher than they have been for years.

I think it right to add that, so far as I am able to judge, no permanent damage is likely to follow to the land if the plague were once removed, and experience of the former visitation seems to support this view.

As already intimated, I am glad to state that Mid-Lothian has up to this time had no visitation of this plague.

I have, &c.

Saughton Mains, Edinburgh, 16th February 1892. JAMES I. DAVIDSON.

APPENDIX.

INFORMATION collected by the HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND on the PLAGUE of MICE or VOLES.

The following letters have been sent to the Board of Agriculture by the Highland and Agricultural Society of Scotland.

RICHARD BELL, Castle O'er, Langholm.

DEAR SIR, 28th January 1892.

I HAVE yours of 26th instant as to the plague of mice or voles, and I may say that I am most willing to give any information in my power on the subject, though I fear that I can scarcely add to what has already appeared in the newspapers.

There is no doubt farmers are undergoing a serious trial, and, I am strongly of opinion, are helpless, unless some natural cause stays the plague. I am very certain man himself cannot do it, and equally so that all the small hawks, owls, weasels, stoats, &c. that are ever seen on hills are unable to do so now.

Think of the extent of country ravaged, and see the millions of holes in which the voles shelter, and one cannot imagine how human power, at any rate, could now do any good. I see from the papers that *one* man killed 32,000 on one farm. Supposing this to be true, it shows that the voles are there in such myriads that those he saw on the surface of the ground in daylight must have been as a drop in the bucketful hidden in their runs and amongst the long grass. My own ground is now badly affected, and my shepherds are unable to kill any appreciable number. We certainly see the voles, but they go like a streak from one hole to another so that it is almost impossible to hit them. Digging holes or poison (illegal?) I am sure would be futile now. Had the plague been confined to a small space, they might be destroyed by continued effort; but when the ground affected is thousands of acres in extent, and holding millions of voles, man's work would be a gigantic one indeed. I am strongly of opinion the continual destruction of their natural enemies, combined with the last few mild winters, is the first cause of the plague. Since it began, a great number of small hawks and owls (weasels and stoats are not so visible) have gathered to it; but what avail are a few dozen or scores of these birds to extirpate such an army of voles. Some years ago the same lands were ravaged with caterpillars, to feed on which starlings gathered together, not in scores, but in countless thousands. When I saw these flocks pass my house every evening for weeks during two hours, to roost at some unknown place, and returning again in the morning, I could understand them able to fight the battle; but all the birds and beasts of prey which are here, assisted by man, are as a flea-bite against the voles, compared to the starlings against the caterpillars.

With these opinions I can suggest no human remedy, and we must now only pray nature to come to our aid. If nature answers our appeal, I fear the cure will be as bad, temporarily at least for the sheep. My only hope would be a sudden thaw after heavy snow to drown them in their holes—those escaping to perish in the slush—or a hard frost suddenly stopping the thaw and sealing up their holes.

With regard to names of farms affected, I may say that the whole of this parish—Eskdalemuir—is bad, more or less. The plague began in the highest land, such as Aberlosk, Langshawburn, Moodlaw, Dumfedling, Fingland, Cassock, Clerkhill, and then spread downwards and outwards till every farm round about is suffering. My own ground of Cruvie and Castle O'er has become very bad in places since autumn began. The damage is not so apparent here at the first glance. The higher lands were bad all summer, and the grass destroyed then has withered away, showing the bare soil, I understand. Here the damage is more recent, and the cool damp atmosphere has kept the grass moist and green; but I find, on scraping aside the grass, the roots have all gone, and the soil bare below; a bad spring will be a great disaster, I fear. Excuse this long letter; but I understand you to want all the information I could furnish, and I have done so, along with my own opinions on the subject.

If the Board of Agriculture send inspectors to this parish, which is approachable from Lockerbie Station, Caledonian Rail, I shall be glad to offer them hospitality when here, though I have no horse to drive them about.

I am, &c.

F. N. Menzies, Esq. RICHARD BELL.

The Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.

DEAR SIR, 25th January 1892.

I FIND from my inquiries the mice plague is more extensive in Dumfriesshire than I was aware of. It seems to prevail on most of the hill-grazings from Thornhill eastward along the northern boundary of the county of Dumfries. It varies a good deal in its severity on different farms. On some the mice or voles are swarming, and have done great damage—some sheep having been removed owing to the scarcity of keep, while those left have suffered in condition. Where they are not very numerous the farmers are, of course, fearing they will speedily increase; while others, whose grazings are as yet free from the plague, are afraid that it will come their way soon. I suppose such a general statement as the above will be sufficient in the meantime. I can easily get the names of the farms affected if the Board of Agriculture wish it. Of the serious and alarming nature of the plague there can be no doubt. The suddenness with which the mice have made their appearance on some farms is reported as being a striking feature in the history of the visitation. I fancy it is desirable any inspection and investigation that may be undertaken by the Board of Agriculture should, if possible, be set about soon, before the new grass comes. It might be desirable to inspect some of the ground after the new grass has sprung, as well as before the winter is quite past.

Yours, &c.

F. N. Menzies, Esq. JOHN GILLESPIE.

Appendix I.

The following are some of the farms affected: In *Nithsdale*—Mitchelslacks, Gubhill, Craigshiels, Holehouse, Gilchristland, Auchencairn, Townfoot, and Morton Mains. In *Annandale*—Kinnelhead, Locherben, and other farms in Evan Water. In *Eskdale*, almost all the farms in the northern part of the parish of Eskdalemuir.

WALTER ELLIOT, Hollybush, Galashiels.

(*Sending the following correspondence.*)

DEAR SIR, 30th January 1892.

I ENCLOSE a number of letters received in answer to mine; they are from reliable people, and have all the same story regarding the damage by mice. I have spent two days this week in the Ettrick district, and intend going into the Hawick district on Monday, and see some more of the farms. I was quite prepared before I left home to see a deal of damage; but one has no idea of the damage until one sees it. The mice are in myriads, and, over hundreds of acres, have eaten up every green thing. These letters do not exaggerate the matter in the least degree; it is the most serious matter that has overtaken the farmers in that district in anyone's memory, and, worst of all, no one can see when or where it will end. There are already some thousands of sheep sent away to wintering. I saw droves of them going away the days I was there, and tons of Dutch hay being driven up to feed those that remain. That hay will cost nearly 20*s.* per ton to drive from railway station, some of it more. What they will do with their sheep in the spring, when they must come home, is more than I can see, unless some great change take place, and that speedily. I hope the Board of Agriculture will investigate the matter. I have no hesitation in saying there is more damage done upon one farm than all the damage over the whole country to the turnip crop by the moth or caterpillar that we heard so much about.

I am, &c.

F. N. Menzies, Esq. WALTER ELLIOT.

P.S.—I sent the following questions to the parties: 1. The cause of the great increase? 2. The amount of damage done? 3. The time they appeared? 4. Is there much increase? 5. The method, if any, you have adopted for destroying them?

Howpasley, Hawick, N.B.,
23rd January 1892.

In answer to your questions regarding the plague of mice or voles—

1. There is no doubt that the cause of their great increase is due to the great destruction of vermin, their natural enemies, by keepers, not as much those of the proprietors as those of the shooting tenants.

2. The amount of damage is not easily estimated; but I may state that almost the whole of the bog land is at present totally worthless for pasture, while the white land is also very much overrun with them, and now they have begun to attack the heather.

3. We have had them more or less since they were so bad about 15 years ago; but it is only within the last 18 months that they have shown signs of increase, and during the last spring and summer the increase has been enormous.

4. At present their number is rather diminishing than increasing. They do not seem to be breeding to any extent just now; at the same time their area is increasing.

5. Several methods of destroying them have been tried, but all are failures, except men with sticks or light spade and dogs. In this way I have killed them at the rate of about one hundred per hour. Owls and sparrow-hawks are very plentiful here just now, but of weasels there are hardly any to be seen. Crows, at the time the mice were breeding, killed large numbers of young ones by tearing open their nests, and now they are attacking the old ones.

The other methods that have been suggested are—

1. Pits wider at the bottom than the top. These require to be at least 15 inches square at the top and about the same in depth. I have tried them, and find that it takes a man about an hour to make four. Now Sheriff Russell, in recommending them to a gentleman in this neighbourhood, suggested 12 per acre, which means that a man could do about 4 acres per day, in other words, it would take 25 men 38 days to go over the farm of Howpasley, without calculating on the extra work required on the braes, where you might have to make your pit 4 feet deep on the upper side to get it 15 inches on the lower one; but, apart from all calculation in the matter, my pits, ever since they were made, have been standing full of water, with the result that if a mouse gets in, it just swims across and out at the other side.

2. Cats have been tried on Langshawburn, but I am told with very poor success, while a man who is working there with terriers, I believe, reports that he has killed 32,000 in five weeks.

3. Traps.—They are no use.

4. Poison.—The risk in using this is that you might not only poison the sheep, but also the natural enemies of the mice, as well as the shepherds' dogs, thus making the cure as bad as the disease.

5. Burning might do something to help, but for obvious reasons you cannot burn the whole of the ground in one season; but should it be tried I would suggest the same plan that I did to Mr. Eliott Lockhart last spring, that leave should be obtained to burn after the young grass has fairly got a head, and then only the patches where the old withered grass appears and shows that the vermin are undermining it, and then each patch should be kindled on all sides at once, and so surround the mice. I am told that if they get the least scorch they will die.

I think I have given you my ideas on the subject as far as I can in the limits of a letter; but lest my report should be considered as a partial one, being in the infested district (and that for the second time), I would like to suggest that you, with one or two others of the Directers of the Highland and Agricultural Society (*practical men*), should come out and see for yourselves, and thus be able to report on the matter. I could put, say, three of you up for a night or couple of nights, when an impartial report from you would go farther than anything I or anyone feeling the scourge can either say or write, as we have hitherto been made a laughing-stock in the public prints. Should you think of taking a run out to look over the ground, I think you should be two nights here, so as to have one full clear day to see as much as possible. It would be easy for me to take you over some of the worst of the ground and show you a sample, but I do not think that is enough.

I have begun to learn all my sheep that have not heather (lea or moss) to eat cake, and have been giving part hay to the whole for some days past.

If any of the Directors should think of coming out, kindly give me a day or two of previous notice, or ask Mr. Menzies to do so.

I am, &c.

Walter Elliot, Esq. W. M. OLIVER.

DEAR SIR, Midgehope, 25th January 1892.

I HAVE yours to hand about the mice plague, which is very serious in this neighbourhood, and unless some means are taken to destroy them immediately they will take possession of everything in their reach. And the following answers to your questions to the best of my knowledge:—

The cause of their increase is due to the destruction of their natural enemies, such as hawks, owls, weasels, and crows. The amount of damage is very great, as at present every green blade is eaten up, and will cause farmers a large amount of expense to winter their stock. The time they appeared was in the summer of 1890. Their numbers are not increasing at present, as they don't breed during winter. We are killing large numbers of them at present with dogs, but I don't expect to exterminate them in that way. Landed proprietors should be petitioned to allow all their natural enemies to increase, so that they might be able to cope with their destruction; but I think Government should take up the matter immediately.

I remain, &c.

Walter Elliot, Esq. HENRY SCOTT.

Branxholm Park, Hawick, N.B.,

DEAR SIR, 23rd January 1892.

I AM in receipt of yours of 21st, and am glad to hear that the Highland and Agricultural Society is going to move in the matter of the mice plague.

I have much pleasure in answering your replies as far as I can :—

1. Cause of increase.—Chiefly the want of weasels, stoats, and ground vermin; also magpies and hawks. The shepherds say there is not a weasel or magpie to be seen.

2. The amount of damage.—On the farm where the plague is at its height half the sheep stock ought to be removed if other pasture could be got, and not brought back till May. Many men are doing this as far as they can.

3. The time they appeared.—The first time was about 15 years ago, in the same district which is at present most affected, viz., Borthwickhead, Eskdalemuir, and Ettrick. They disappeared more suddenly than they came, and nobody can very well explain the reason. This present plague began about two years ago, and has increased more rapidly and over a much larger area, which is still extending.

4. The number is increasing very much; but just at present breeding has ceased.

5. Several methods have been tried, but men with spades and terriers is supposed to be the most effectual; but no amount of individual effort seems to make any perceptible difference.

Believe me, &c.

Walter Elliot, Esq. CHARLES J. GRIEVE.

Newton, Hawick,

DEAR SIR, 25th January 1892.

I AM in receipt of yours in reference to the mice plague.

1. The cause of their great increase.—I can give no cause.

2. The amount of damage.—Since we got the farm in 1887 we have never thought the lambs up to the quantity or quality they should have been, and more back-going sheep than I could account for otherwise than by the mice hurting the ground. For the year 1890–91 the shortness of lambs, owing to the mice having the ground sore destroyed, 250*l.*

	£	*s.*	*d.*
For the year 1891–92—			
Lightness of clip - - - -	31	0	0
410 sheep wintered away - -	143	10	0
Grass taken to lamb 600 ewes on -	210	0	0
Hay grown on the farm, which the sheep are eating, which they would not require but for the mice - - - - - -	160	0	0

But it is impossible to estimate the damage; and unless the mice depart soon, and the grass come again in the spring (what was eaten in 1890–91 has not grown again), the most of the sheep will be to take away and keep away till the mice plague gets past.

3. The time they appeared.—They have been on the farm since we took it in 1887; but never in such numbers to do very much harm till the autumn and winter of 1890–91.

4. Is their number increasing?—There seems to be a slight decrease in numbers.

5. The method, if any, you have adopted for destroying them, and any other information bearing on the matter in your power.—Tried cats, and have about 100. Four shepherds and a hired man have fox terriers, and they kill from 400 to 600 each man per day when the weather will allow.

It is impossible for anyone to believe the ground is so sore destroyed unless they see it. They have missed nothing; everything cropped to the earth. The future is a terrible looking to. I would be exceedingly pleased if you could spare a day to go out to Langshawburn and see it for yourself; it would not take us long; it is 18 miles from Hawick. By letting me know, I would meet you at the 9 train, or any way more suitable to you.

Yours, &c.

Walter Elliot, Esq. JOHN SCOTT.

DEAR SIR, Gair, 25th January 1892.

I AM in receipt of your note of 21st, asking information about the mice plague. You have stated five questions for me to answer, which I will endeavour to do as correctly as possible.

1. You ask what I think the cause of their great increase is.—I think the cause is greatly due to the destroying of their natural enemies, the hawks, owls, and weasels, &c., which live mostly upon mice. The land round about here has been let to game tenants for some years past—a thing that was never done before—therefore the game watchers have destroyed all the natural enemies of the mice. That is the general opinion in this district of the great increase.

2. The amount of damage done by them.—It is not easy to calculate damage as yet, but it is very great; but I will give you some idea of the damage in 1891. Say a hirsel or farm of 600 sheep: the want of lambs was 25 per cent. all round this district, some more, some less, and back in quality; therefore less money for them. Death of old sheep from 5 to 8 per cent. I would say on a farm of that size there would be 100*l.* of loss in 1891—at least I can say that of my own. As for 1892, I can say nothing as yet; but it will be a great deal worse, as the stocks will all have to be fed extra, which will involve a cost of 5*s.* or 6*s.* a head.

3. The time they appeared was in the month of February to any extent, and increased very fast after that—in fact, they just kept the grass almost down all the year after.

4. Is their number increasing?—No; they have not increased since the month of November; it seems that they don't breed in the winter months, and I think that they are not so numerous as they were.

5. The method of killing them.—I have tried different methods to destroy them; I tried pits, but found that was not practicable, as it took a great deal of work, and cut up a great deal of land, and did not answer the end; dogs and sticks seems to be the best method that I have seen tried. One man, with a stick and a dog, is able to destroy 500 a day, and sometimes more; but that number is never missed, as they are in thousands. I don't think that I can give you any more information about them at present; but could you not come and see for yourself what the country is like. You could give a far better representation of the havoc that has been made by them.

I will be very glad to see you here and show you the ground, and give you all the information in my power.

I am, &c.

W. Elliot, Esq. ALEX. LAIDLAW.

DEAR SIR, Annelshope, 26th January 1892.

I RECEIVED yours of 21st about the mice, and give you the following answers to your questions as I have seen on this farm. They appeared earlier in greater quantities higher up about Tima Head. It is difficult to state the amount of damage done. The bog and benty bog is useless, and they are getting fast through with the lea. I believe if some bait could be got to attract them into the old kind of mouse traps it would be more effective than dogs.

A number of the farmers round here are thinking of advertising for weasels, which we think are most likely to put them down if we can get them in quantity.

I hope the Board of Agriculture may take the matter up, but there is short time now till they will begin breeding again, when it will be more difficult to get the better of them.

1. The cause of their great increase.—The scarcity of enemies to keep them down. There are very few weasels: we rarely see one or their track in the snow. Hawks and owls are not plentiful.

2. Amount of damage.—It is not possible to state the exact amount of damage, but am safe when stating that half the farm is worthless in the meantime, and the other half much damaged.

3. The time they appeared.—I noticed them more plentiful than usual in the autumn 1890 and last spring, but it was last summer when the great increase was.

4. Is their number increasing?—I don't think they have been increasing since the month of September or October.

5. The method, if any, you have adopted for destroying them.—I tried pits, but was not very successful; got a number when in wet land, or after heavy rain when there was water in the bottom. Have tried several kinds of traps, but either failed to deceive them or had a want of attractive bait. Have killed most with

Appendix I.

dogs, with which they might be thinned, but it will require something more effectual than dogs or anything yet tried to put them down.

I am, &c.

Walter Elliot, Esq. WM. BRYDON.

West Buccleuch, Selkirk,
28th January 1892.

DEAR SIR,

IN reply to yours of 21st instant in regard to the mice:—

1. The cause of the great increase of the mice is, I believe, the destruction of the weasels, hawks, &c., and in proof of this, three years ago, when there were no signs of this plague, the shootings here and on a few more adjoining farms were let to an English shooting tenant, who at once put on keepers, one of whom lodged with a shepherd on my farm, and in a short time he trapped upwards of one hundred weasels, also a number of hawks, &c., and in the course of next season the mice began to appear.

2. The damage done is so extensive that although I have nearly the half of the sheep stock removed from the farm, I do not see how the other half can subsist on the land until the grass comes.

3. They began to appear as a plague about 18 months ago, and the damage done last spring was very great, so much so that the sales of sheep from this farm were considerably affected on account of the want of condition of the stock.

4. They are not increasing at present, as it is not the breeding season.

5. We have been killing them with sticks and dogs, and we have killed, within the last three months, upwards of 13,000,—previous to that we did not keep count of them, and this does not seem to affect their numbers.

I am, &c.

JAMES GRIEVE.

Walter Elliot, Esq., Hollybush.

DEAR SIR, Milsington, 26th January 1892.

I HAVE yours of 21st, and will be very glad indeed to give you all the information in my power regarding the plague of mice or voles, by answering your questions.

1. The cause of the great increase, I think, is due to the over-destruction of their natural enemies—weasels, owls, and hawks. From observation and inquiry, there is scarcely a weasel to be seen in this part of the country. If possible, they should be imported and strictly preserved. Owls and hawks are much more numerous lately—seem to have been drawn by the increase of food; but the mice getting to such an extent will take a long time before they stop them. They began on the range of hills from Teviot to Ettrick, separating Roxburgh and Selkirk shires from Dumfriesshire (the same as some 16 years ago), where there is almost no plantation to harbour these birds of prey.

2. The amount of damage.—Thus far the damage is greatest on farms with a large proportion of bog-land, which they prefer. When it gets done they spread to bare lea, and heathery land also. Some farms in this district are so much damaged there is not grass left to winter more than half the stock. If the mice were exterminated now, much of the land will be very poor pasture the first season. Some farmers have taken stock off the land; others feeding with hay, &c. They are attacking young plantations, peeling the bark off the trees.

3. The time they appeared.—They have been on the increase for three summers; not easily seen until they get pretty thick; began to show more in the autumn of 1890, and have spread rapidly since.

4. Is their number increasing?—They increased fearfully fast through summer; are stopped breeding meantime; have seen no young since October.

5. The method of destroying them.—Men and dogs are the most effectual means of killing I have seen. My farm is very heathery, and it is almost impossible to get at them in it. Killed great numbers in my cornfields during harvest; fear they will take the seed this time, especially on lea. They get cover between the furrows. Some gamekeepers are trying to put the blame on farmers for not burning more of their hills, which I think absurd. There is as much burnt as formerly, and some that were severely burnt are equally as bad, and it is only bent that should be burnt; no one would think of burning strong bogs. Landlords should stop their keepers and those of their shooting tenants from killing these natural enemies (what they call vermin), and give them a trial.

The common crow picked out the nests, and I think would kill lots of the young mice.

I am, &c.

Walter Elliot, Esq. CHARLES SCOTT.

DEAR SIR, Dumfedling, January 29, 1892.

I AM favoured with yours of 21st, and am glad the Highland and Agricultural Society have taken up the question of serious damage done by mice on hill farms in this and other districts. The following answers to your questions are given as far as I am able to do so, and hope they may be of some use.

Any other information you may desire I will gladly give.

1. The great increase is to be attributed to the almost unprecedented roughness of the ground in the summer of 1890, by which means abundant facilities for breeding was afforded, and obscurity from their natural enemies secured.

2. It is impossible to estimate the damage until the lambing season is over; but in the meantime the *whole* of the winter grasses (heather excepted) are nibbled at the roots, and the roughness on the surface is destitute of nourishment, and, as a consequence, sheep are getting lower in condition even under the best of weather.

3. The time they appeared in greatest numbers was in the spring of 1891 and following summer.

4. Their number at present is not increasing. I have tried killing them with men and dogs, but find it impossible to exterminate them; all the killing that has been done does not seem to lessen their number to any noticeable extent.

There will have to be very large reductions of rent in the first instance; and if the mice remain with us, then pastoral farming is done.

I am, &c.

Walter Elliot, Esq., Hollybush. THOS. BEATTIE.

DEAR SIR, Craick, January 30, 1892.

YOURS to hand. Would have answered sooner, but have been from home.

Regarding your questions about the mice plague, I may first say they are much worse than they were 15 years ago.

Answers to questions.—1. The destruction of the balance of nature, owing to their natural enemies having been killed.

2. The *whole* of my farm totally destroyed.

3. About lambing time 1891.

4. They are not increasing just now, not being their breeding-time; but there is no perceptible diminution in their numbers.

5. The shepherds, with sticks and their dogs.

I may say I have killed 100 in one hour; but do what we can, they are too numerous to cope with.

I am, &c.

JAMES MOFFAT.

DEAR SIR, Lynnwood, 1st February 1892.

I HAD your letter of 21st January, which I should have answered sooner, but press of work just now has caused me to put off. In answer to your questions, I have to state—

1. In my opinion, the cause of the great increase of the mice was the extraordinary growthy season of 1890, when there was such an amount of roughness on the hills, which not only afforded food but shelter both from weather and their natural enemies, combined with

the destruction by gamekeepers of weasels, hawks, owls, &c.—which destruction, I may say, was carried on to the greatest extent upon farms which were in the hands of shooting tenants.

2. It is not easy to say what is the amount of damage; but upon the farm of Glenkerry, in Tima Water, the ground is entirely destroyed—the good land as well as the bad, low-lying at well as high. One-third of the stock of sheep upon that farm is removed from the ground already, and the remainder I intend to feed through the spring months with Indian corn without removing them. Upon mice-infected farms the grass will be late in coming this season; and the crop of grass will not be plentiful, owing to the roots being destroyed.

3. I think the mice appeared to be numerous, and to cause alarm, during the summer of 1890.

4. The numbers are not increasing at present, as it is not the breeding season; that begins in March or April. But the creatures at this season, owing to their numbers, are spreading themselves over a larger area, and are spreading in all directions round and round the infected district. The reason of this is that, upon land where they have been so numerous, the land will not sustain them longer, and has become foul, and they are compelled to seek fresh ground.

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5. I had a man killing for a month on Glenkerry, and he would in that time kill upwards of 15,000. He had two collie dogs, and used a common spade himself. Sticks are of no use, as you cannot hit them. You require a flat thing like a spade, and then you are surer. Killing, however, is of little avail, and never seems to make them appear any fewer. Unless every farmer did it simultaneously it would do little good; for if killed out upon one farm, they would just come to it again from another.

I am, &c.

Walter Elliot, Esq., Hollybush.

JOHN OLIVER.

APPENDIX II.

Appendix II.

LORD GLENBERVIE'S ACCOUNT of the DEVASTATIONS of FIELD MICE in the FOREST of DEAN and in the NEW FOREST in 1813–14.

(*Reprinted from "The Zoological Journal" for January* 1825.)

An Account of the unexampled devastations committed by Field Mice in the Forest of Dean in Gloucestershire, and in the New Forest in Hampshire, during the years 1813 *and* 1814. *In a letter to the late Right Hon.* SIR JOSEPH BANKS, *Bart., P.R.S., from the late Rt. Hon.* SYLVESTER DOUGLAS, LORD GLENBERVIE.*

Whitehall Place,
30th June, 1814.

DEAR SIR,

THE great devastation committed during the course of the last and the present year, in our young plantations in Dean and New Forests, by an unexampled number of Mice, which have overspread those forests during that period, having been the subject of repeated communications with which I have troubled you, I flatter myself that it will not be uninteresting to you, to see collected together all the material facts and circumstances which I have been able to obtain either from personal observation or the information of others concerning this new plague; I call it *new*, because, although the destruction of acorns by that vermin has been always known, and mentioned by every writer treating upon such subjects, from the earliest time, yet I have not found in any author, from Theophrastus and Pliny downwards to Evelyn and the more modern writers of our day, the smallest hint of the mischief of which I myself have been a witness to a most alarming extent, which those pernicious little animals have done in our plantations by devouring the bark of the young plants, all round from the ground to the height of about six inches, and in many instances gnawing the root itself through and through.

The whole, both the Dean and New Forests, appears to be numerously stocked with Mice, at least wherever the large furze-brakes in the open parts have been burnt, their holes and runs are perceived to cover the whole surface. This was particularly the case over a district called Haywood Hill in Dean Forest, and which now forms one of the new plantations in that forest, containing about 500 acres.

In the autumn of 1810, Haywood inclosure was first completed so as to exclude all the commonable cattle, and the few Deer still remaining in that forest, and was then planted with acorns. In the spring following, plants from about one third of those acorns came up, the remainder it is probable were destroyed principally by Mice. The natural hollies which it had been necessary to cut down in order to give room for planting the acorns, had made young shoots, but no attack was made upon them in the winter of 1811. The runs of the Mice however appeared very numerous. In the autumn of 1812, a large quantity of five years old oaks and chesnuts, with some other forest trees, as ash, larch, and fir, were planted at regular distances in the same inclosure. In the winter of that year, the first symptoms of the devastation by the barking of the plants were perceived by the woodman in the shoots of the hollies that were now got to the height of two, three, or more feet, great numbers of them being barked round at the ground for four or five inches upwards, and in conquence dead or dying. This soon became almost universal over the whole of that inclosure. In the spring following (1813) a number of five years old oaks and chesnuts were found dead, and on being pulled up, it appeared that the roots had been gnawed through two or three inches below the surface; many were also barked round and killed in the same manner as the holly shoots, and a great number begun upon, and consequently become sickly, though not as yet entirely killed. The evil was observed about the same time to have extended itself to some of the other inclosures.

The first notice I received of this misfortune was by a letter from the Deputy Surveyor of Dean Forest to our Secretary in the Department of Woods, dated 14th May, 1813, and I cannot give a more lively impression of the serious alarm excited by the evil than by transcribing the words of that letter.

"I am very much alarmed at the danger likely to arise to the plantation from the Field Mice, particularly in Haywood and Crabtree Hill Inclosures. The woodmen in both have found five years old oak and chesnut plants, in various places barked round at the bottom, and consequently dead; but their principal devastation at present is confined to the young shoots from the hollies that have been cut down, which they have barked so universally as to destroy them entirely on about fifty acres of Haywood Inclosure, which are now looking brown and withered, as if they had been nipped by the frost; and I fear that when there are no hollies left (and it seems to me that they will very soon destroy them totally) the young trees will suffer more considerably.

"As I am quite at a loss as to the method of extirpating them in such situations, I will thank you to inform me, whether you have any information which is likely to be useful in this case, contained in the different answers to the queries proposed by Lord Glenbervie on this subject, and that you will communicate it to me. The land, as you know, is covered with long grass, fern, &c., under which these Mice have runs or roads, and they are seldom seen above ground. They are the short-tailed reddish-coloured Field Mice."

On receiving that letter, I was under the necessity of acquainting Mr. Davies, the Deputy Surveyor, (whose name I am happy in an opportunity of mentioning, in order to bear testimony to his skill, diligence, and integrity, in an office in which those qualities are peculiarly requisite) that the source to which he referred, afforded no such information as he expected. Having however heard about this time of the success of the method of Mr. Benjamin Broad, of

* Communicated by William Elford Leach, M.D., F.R.S., F.L.S., &c

Appendix II.

Herefordshire, in the destruction of Rats and Mice, I desired that Mr. Davies would correspond with him on the subject, and if he saw any reasonable prospect of advantage in employing the means he recommended for the destruction of Field Mice, to engage him to go over to Dean Forest, and make a trial of his process under his own superintendence and direction. This was accordingly done. Mr. Broad went to Dean Forest, and after trying his peculiar baits for three days in Haywood Inclosure, which was the most infested, without any success, he gave up the attempt as hopeless, ascribing the failure to the different nature of the food of these Mice, from that of those he had been accustomed to deal with, which appear to have been the common house Mice.

In the beginning of September, 1813, I had myself an opportunity of personally observing in Dean Forest, and in a week afterwards in New Forest, the mischief done and to be apprehended from these vermin, and I ordered every means that occurred either to myself or others, to be used for their destruction.

1. The first and most obvious was to procure a number of Cats to be turned out in the inclosures, and sixteen having been brought to the woodman's cottage in Haywood, the old ones being let loose, killed a great number, and travelled to a considerable distance, but there was reason to fear that a fair trial could not then be made of that remedy, for there were no means of confining them to any particular spots, and as soon as the digging of holes or trenches (as I shall afterwards state), was adopted, they became nearly useless, as they satisfied themselves with the Mice that were caught in them without hunting for others.

2. Another expedient has been to clear away the bushes, furze, fern, rough grass, &c., and so expose the Mice to the stronger vermin and birds of prey, but this was also soon abandoned on account of the great expense incurred, in order to keep down that natural cover.

3. A great variety of poisons have been tried, mixed up into a kind of paste, with grease, flour, &c., viz., arsenic, nux vomica, ratsbane, corrosive sublimate, ground glass, &c. The Mice appear to have eaten of them all, but we have no means of judging of the effect, as none of them were found dead, except in the holes. In one inclosure, consisting of forty acres, where these poisons had been tried, nearly 2,000 Mice were soon afterwards caught, which seems to prove, that the poisons employed had not been very effectual. Nux vomica was the most so.

4. Seven or eight different sorts of traps were set in the places most infested. Those combined with small pitfalls were found to answer best. They consisted of a box sunk in the ground, with the top level with the surface. This top had a pin passing through the centre which turned on a pivot, upon which it was put into the box, and when the Mouse came in pursuit of the bait, he was precipitated into the box below, and the top returned to its former station; wooden traps of this description were used at first with some success, but the moisture of the ground making them swell, and preventing their working, tin ones of the same sort were substituted and answered very well, catching great numbers. They were however superseded by the trenches or holes, which were cheaper and succeeded better.

5. The plan of the holes which has answered so well, was first suggested by a man of the name of Simmonds, a professed Ratcatcher, who having been employed to catch the Mice, had observed, on going to work in the morning, that some of them had fallen into wells, or pits, accidentally formed, and could not get out again; many of them dying from hunger or fatigue in endeavouring to climb up the sides. Such pits were therefore on his recommendation immediately tried. They were at first made three feet deep, three long, and two wide; but these were found to be unnecessarily large, and, after various experiments, it appeared that they answered best when from eighteen to twenty inches deep at the bottom, about two feet in length, and one foot and a half in width, and, at top, only eighteen inches long and nine wide, or indeed as small as the earth could be got out of a hole of that depth; for the wider they are below, and the narrower above, the better they answer their purpose. They were made twenty yards asunder, or about twelve on an acre; or, when the Mice were less numerous, thirty yards apart.

Nearly 30,000 Mice had been caught, principally by this last method, in Dean Forest, up to the 22nd of December last, and Mr. Davies is convinced that a far greater number have been taken out of the holes, either alive or dead, by Stoats, Weazels, Kites, Owls, &c., and even by Crows, Magpies, Jays, &c. The success of these holes in Dean Forest, has been so great, that the use of a bait in them was soon discontinued; but, from an inaccuracy in the digging of them, or some other cause, they have been far less efficacious in New Forest, where the Mice continue still, though less numerous now, to infest our plantations.

It was hoped, that the late severe weather would have either totally destroyed, or greatly diminished the numbers of these animals, for they did not venture out during the hard frost. In a letter from Mr. Davies, dated the 8th of March, 1814, he gives only 1,246 as the number taken from 7th January to the 5th March, and he says, the whole of these had been caught in a few days of open weather which intervened about that time.

The total numbers caught in Dean Forest to the 8th March, 1814, did not much exceed 30,000, and in New Forest, only abont 11,500 had been taken, up to the same period.

On enquiring whether the Mice had ever actually been seen in the act of barking the young trees, by any of the woodmen or labourers, or, if not, what reasons there were for concluding with certainty that *they* were the depredators, I found that Simmonds, the Ratcatcher before mentioned, and Hobbes, one of the woodmen, have asserted, that they have *seen* them gnawing the bark at the height of three and four feet, to which distance they had climbed from the ground. Besides this direct evidence, that the mischief was done by Mice, and not by other animals, as Hares, Rabbits, &c., (of the former of which, there are very few in either of the Forests, and of the latter, none in either); the gradual decrease of the evil where great numbers of Mice have been destroyed,—its total cessation in the parts first holed;—the same dung found in the holes where they have been caught as was observed, in numberless instances, near the trees barked;—their being taken in the very runs close to which trees have been found eaten through the roots;—and, when some young shoots of oak and holly have been cut and thrown into the pits, their having begun to gnaw the bark immediately;—all these circumstances taken together, amount in a manner to demonstration. The last-mentioned experiment has been frequently repeated.

In both Forests, two sorts of Mice have been observed, one the short-tailed, the other the long-tailed *Field Mouse*. The former (by far the most numerous, but particularly so in Dean Forest, being there in the proportion of upwards of fifty to one long-tailed) seems to be the *Campagnol* of Buffon, and Pennant gives that as the French for his *Meadow Mouse*. The long-tailed appears to be Buffon's *Mulot*, which name Pennant gives as the French for his own *Field Mouse*. *Campagnol* is the only species of short tailed Mouse mentioned by Buffon, who says, he was the first who applied that name to it in French, having adopted it from the Italian, *Campagnolo* (which word however in Italian, corresponds generally to Field Mouse, or *Souris des champs*); one of its names formerly in most common use in France, appearing from him to have been *Mulót à courte queue*, while the true *Mulot* in some places is called, *Le Rat à la grande queue*, *Mus caudâ longissimâ*. It is only in this incidental way, by mentioning the different appellations of this last animal, that Buffon takes notice of the length of its tail. There is indeed considerable inaccuracy and confusion in the accounts given by different authors of the various species of Rats and Mice, of which thirty-four are enumerated by Buffon, (or rather by his posthumous editor). Buffon thinks several writers have fallen into a mistake in subdividing the species called *Mulot* into two, partly from their observing very great differences in the size of different individuals of that species, and partly from their taking the *Mus domesticus medius* of Ray to be a distinct species of the *Mulot*, but which, though shortly and inaccurately described by Ray, and seemingly from the account of others, not ocular inspection, Buffon supposes to be only a *Mulot* not grown to its full size. Though the word *domesticus* is not applicable to it, Pennant gives that among the appellations of his *Field Mouse*. Buffon says, the *Mulot* appears to be a long time in coming to its full growth, and that, when it does, it is four inches and two or three lines, or twelfth parts of an inch long, from the tip of the nose to the root of the tail; that the smallest are an inch

shorter, and, that they are found of all the intermediate sizes. He seems to consider the *Mulot* in general, as a more powerful animal than the *Campagnol* or short-tailed Mouse; for he says, the latter is scarcely more than three inches long from the nose to the tail; and mentions that the *Mulots* when they fall short of food in winter, not only devour the smallest of their own species, but also the *Campagnols*, whereas speaking of the manner of feeding of the latter, though he says, they eat one another in times when their more natural food is scarce, he immediately adds, that they serve also for food to the *Mulots*, &c., without mentioning that they ever eat the *Mulots*. But, on the contrary, in Dean Forest, the *short-tailed large-headed Mouse*, is considered as the more powerful animal, and when full grown, is considerably larger than the *long-tailed Mouse;* and Pennant describes *his Field Mouse* as measuring, from the end of the nose, to the setting on of the tail, only four inches and a half, and the tail as four inches long, while he states the length of his *Meadow Mouse* to be, from the nose end to the tail, about six inches, and that of its tail only an inch and a half. We have not yet been able to prove, by actual experiment, or observation, that the long-tailed Mice bark the trees, though it is believed, in both Forests, that they do. Both Buffon and Pennant describe both sorts as burrowing underground. Buffon says the *Campagnol* is found in a greater variety of situations than the *Mulot;* that the *Mulot* chiefly frequents high dry ground, woods and neighbouring fields; the *Campagnol* not only woods and adjoining fields, but also meadows and gardens. According to Pennant, though the *short-tailed Mouse*, in its manners, and general food, much resembles the *Mulot*, it differs from it in the places of its abode, and seldom infests gardens. In Dean Forest the few *long-tailed* Mice that have been taken, were on the wet greens, and never on dry ground; the *short-tailed* equally infested the wet and dry ground. According to Buffon, the *Mulot* establishes himself in holes which he finds already made, or which he forms for himself, under bushes or in the trunks of trees; that he there amasses a prodigious quantity of acorns, nuts, or beechmast; that a bushel has sometimes been found in one of their holes; and, that they collect this provision, not in proportion to their wants, but to the dimensions of the hole; that these holes are ordinarily a foot underground, and often divided into two chambers, one of which they inhabit with their young, and use the other as their magazine. Similar hoards of acorns, nuts, &c., have occasionally been found in both our Forests; but no divisions have been observed in their holes in either. Buffon furnishes us with a probable explanation of the cause of the failure during the last several years of our *planted* acorns. He says, "I have often "experienced the injury which these animals (*Mulots*) "occasion to plantations, they carry off the acorns "newly *sown*, following the line of the furrow traced "by the plough, and digging up one acorn after the "other, without leaving one. This happens most "commonly when there is not a very abundant crop "of acorns.* If they do not find enough in the woods, "they come and search for them in the lands which "have been newly sown with acorns, which they do "not eat on the spot, but carry to their holes, where "they heap them up, and leave them often till they "dry and rot. These animals do more harm to land "sown for timber, than all the birds and other "animals put together." He then mentions, as the only method he had found of preventing this mischief, very nearly the most simple sort of trap which we have used both in Dean and New Forests, but which has proved so inefficient in our extensive plantations. He says, he had used the same means against the *Campagnol*. At first, in a space of about forty acres, he caught about one hundred of the two sorts daily, and had taken, in that space, more than 2,000 in three weeks. He says, that, during the hard frosts, they confine themselves to their holes, and feed on the acorns, &c., they have amassed there. This has been the case in both our Forests.

You will pardon these imperfect compilations from Buffon and Pennant, although they will probably be found of little use after your own more accurate enquiries, and the scientific investigation of Dr. Leach, to whom, at your desire, have been transmitted numerous specimens of the two sorts of Mice in our two Forests, and an accurate drawing and colouring of one of each sort. Perhaps the details given by Buffon may merit a little more attention in this case, than in many others, where that eloquent writer is more than suspected of having too often indulged his imagination and love of theory in his representation of facts; because, as a planter, his personal interest seems to have attracted his attention in a peculiar manner to this particular subject.

Mr. Harvey, a very intelligent person, who has long had the management of Lord Bagot's extensive woods in Staffordshire, has informed me, that some years ago, an extraordinary quantity of Mice made their appearance in those woods. There were no very young plantations there, and he did not observe that they gnawed the bark of any of the trees; but a severe winter having supervened, vast numbers of them were found dead upon the ground. This case contributed to encourage the hope I have before mentioned, that a similar destruction would have happened this year in our Forests, and also furnished reason to conjecture, that the great multitude of those vermin, which infested our inclosures last season, might have only been a sort of accidental epidemical plague, not like to have returned, perhaps, till after our plants should have outgrown the danger of any further injury from them; for they do not attempt to bark or eat the roots of trees whose stems have acquired a diameter of two or more inches.

It is proper to mention, that they bark indiscriminately, besides hollies and oaks, ash, chesnuts, beech, &c., and, as has been lately observed, even larch and fir.

Mr. Davies informs me, by a letter dated the 5th instant, that in Dean Forest, no Mice have been taken for a very considerable time; and that having inspected the several inclosures which had been infested with them, no traces of them were then visible, nor any appearance of recent damage; so that he hopes they may have been effectually exterminated, and that the mischief done last year, will not recur in the ensuing season. Directions however have been given to the woodmen, still to attend to the holes, keeping them open, and inspecting them from time to time.

In New Forest, on the 13th instant, I was informed, that 776 short-tailed and 56 long-tailed mice had been taken since the 29th ultimo. I continue to have a weekly return from that Forest.

You know the unsuccessful pains I took when the alarming damage which was discovered to be done by Mice in our plantations, by barking the young plants, was first made known to me in the month of May last year, to discover if the same mischief had been observed to be occasioned by these vermin at any former period, either in those Forests or elsewhere, in order to learn whether any methods had been discovered to check or prevent its return; and your own enquiries were, I understand, long equally unsuccessful. None of the oldest officers in any of the Royal Forests had ever observed or heard of such a thing, though with the injury done by Mice in destroying acorns when sown or planted, they were all familiarly acquainted. About thirty years ago, several inclosures and plantations of oaks of considerable extent had been executed by Mr. John Pitt, then Surveyor General of Woods and Forests, in New Forest, which at first had appeared to be very promising, but at that time several of the underkeepers having been permitted to establish Rabbit Warrens in different parts of the Forest near the new plantations, and those animals breeding so fast, and in such numbers, it was soon discovered, that the plants rapidly disappeared, and in a few years, no vestige of them remained. This failure of so great a national object, attracted a great deal of attention and observation at the time. Yet, from whatever cause, it was, till within these few years, found impracticable to destroy the warrens, or extirpate the rabbits. At last, however, I myself had the good fortune to devise a method of doing so, which has proved completely effectual. Neither at the time when the destruction of those plantations took place, nor when the extirpation of the rabbits was afterwards so long under consideration, the possibility that Mice, which must have at all times abounded in the furze and fern coverts in the Forest, might have had a share in the destruction of the plants by *barking* them, seems ever to have occurred, or at least, to have ever been mentioned by any body on those occasions, though now, in consequence of our late observations, there can be little doubt of that having happened. One of the under-

*There had been an extraordinary failure of acorns in both our Forests the three last years.

Appendix II.

keepers indeed, who had had the most productive warren, alleged to me, *last year*, that he had, *at the time*, mentioned, that the injury was done by Mice; but that nobody would then listen to him, as there was such a general prejudice against the rabbits; but I am very much inclined to think, that this was an after-thought, as neither the deputy, nor any of the other persons then conversant with the Forest, have any recollection of his having said so. However, what you have lately learned to have been observed in Lord Downe's Woods in Yorkshire, proves that this tendency of the Mice to eat the bark of young trees, had heretofore been observed there.

I have the honour to be,
Dear Sir,
With sincere respect and esteem,
Your very faithful and obliged humble servant,
GLENBERVIE.

Appendix III.

APPENDIX III.

SOME ACCOUNT of the PLAGUE of FIELD MICE in the BORDER FARMS, in 1876-7, with OBSERVATIONS on the GENUS ARVICOLA in general. By *Sir Walter Elliot, F.R.S., F.L.S., &c.*

(Reprinted from the "*Proceedings of the Berwickshire Naturalists' Club*," vol. viii., 1878.)

THE animals forming the fourth order* of the mammalia, although timid and defenceless, "a feeble folk," are nevertheless capable of doing much mischief and of causing serious damage to mankind. Armed with two pair of adze-like incisors they are able to cut through wood, and even the softer metals, and to inflict considerable injury on fields, woods, and gardens. Hence the name of *Glires* proposed by Linnæus for the order (from *glis*, a dormouse), has been changed by later systematists, into that of *Rodents* or *Gnawers*.

Breeding often in the year and producing several young at a birth, they multiply with great rapidity, becoming very destructive where the supply of food is unfailing, as near human habitations or in places where suitable sustenance is abundant. Even where these conditions are less favourable, and their depredations are not so constant, they often prove highly injurious. To say nothing of the damage done by rabbits, hares, squirrels, &c., the North of Europe suffers from migrations of countless swarms of lemmings, while some parts of our own country are invaded at intervals by swarms of field-mice, which, issuing from their usual haunts, disperse themselves over pastures and plantations, and devour everything edible that comes in their way.

These belong to the genus *Arvicola* of Naturalists, three species of which inhabit Great Britain—the Water Rat (*A. amphibius*), the Red or Bank Vole (*A. glareolus*), and the Field Vole (*A. agrestis*).† They are distinguished from the true mice (genus *Mus*) by their stouter body, thicker head, obtuse muzzle, small ears, and the tail shorter than the body, whence they are often called short-tailed mice. The molars, or back-teeth, have flat crowns, with tranverse ridges of enamel, adapted for grinding the vegetable matter on which they feed, whereas in true mice they are covered with points or tubercles suitable for an omniverous diet.

It was the last-mentioned, or field vole, that made its presence so conspicuously felt, and caused so much damage to the higher lying sheep-farms along many parts of the Borders, in the winter and spring of 1875-76. They had been observed to be more numerous than usual during the three or four previous seasons, but not to the extent of causing serious inconvenience. In the spring of 1876, however, their numbers became alarming. The districts most seriously affected were the hill farms, on the borders of Roxburghshire, Selkirkshire, and Dumfriesshire, especially those contiguous to the watershed, between Teviotdale, Eskdale, and Liddesdale. Further west the higher portions of Upper Nithsdale suffered seriously, though in a less degree. No complaints were heard from Northumberland, or the sheep-walks to the eastward along the Cheviot range, but in many places they were observed to be more numerous than usual. The same may be said of the Cumberland and Westmoreland sheep-farms, and of those in North Wales, but in parts of the West Riding, as in Wensleydale and Bedale,‡ they were found to be troublesome. Small communities were met with here and there, in unwonted spots, during the summer and autumn months of 1875-6-7, where the luxuriant pasturage afforded a temporary retreat. But they may be said to be distributed more or less sparingly, at all seasons, over the whole island wherever food and cover are suitable, and to occur at all elevations. Dr. Buchanan White found traces of them on Ben-na-Mhuic-Dhu, at nearly 4,000 feet, and picked up a dead one on another hill, at 2,700 feet, which, from its position, had apparently been brought down from a higher altitude by water.

Their favourite haunts are low-lying moist grass-lands and damp plantations, especially when young. In such spots, and more frequently in the former, they live in communities, forming numerous burrows at no great depth, each pair having their own dwelling, in which they bring up their young, and deposit their store of winter food. The burrows are kept scrupulously clean, their droppings being deposited in little heaps outside. All around, their tortuous runs are seen on or near the surface, showing where they have been foraging. An obliging correspondent has sent the subjoined sketch of one of these places, observed near Auchenbreck, in Dumfriesshire. "Their roads," he states, "as you will perceive, form a network, and run

"sometimes a little below the ground, but generally on "the surface, among the upper roots of the grasses. "The little dots on the sides of the runs represent small "holes, an inch or two long, made solely, I should think, "for the purpose of getting food by the way. In this "way the grass roots, in many places, have been quite "destroyed."

Its diet is principally herbivorous, consisting of roots, young shoots of grass, the tender bark of shrubs, &c. It particularly affects the delicate white stems, rising immediately out of the earth, but in times of scarcity nothing green comes amiss to it. When pressed, it is said to devour insects, and even its own kind.*

Its habits are diurnal, and it may be seen running about all day, but in greater numbers in the evening. Another intelligent and accurate correspondent, describing their ways, says, "it takes a very quick eye "to observe them in rough ground, as they run with "such rapidity, that they seem to disappear like a "streak, as it were; the movement is so quick that "there is hardly time to distinguish the form of the "creature." The same gentleman had an opportunity of watching them in more open ground. Passing through Sir F. Johnstone's park, at Westerhall, in Dumfriesshire, in the summer of 1876, he saw great numbers running among the grass near the road. "At "one time I stopped to watch them, and it was "curious to see how tame and confidential they "became, as soon as I stood still. They chased each "other back and forward along their runs, and when-"ever they saw me move, they darted into their holes, "one of which they seemed easily to find. they were "so numerous. As soon as they thought themselves "safe, they wheeled round and stared up in my face, "with their beautiful bead-like eyes for a long time, "till having made up their minds that I meant them

* Of Linnæus, Syst. Nat.

† Continental Naturalists calls them *Campagnols*, which Dr. Fleming altered to *Vole*, a change approved by Macgillivray (Nat. Lib., vii., 260) "although," he observes, "it has no meaning." But it may appropriately be derived from the French *voler*, "to plunder, to rifle, to strip." The name does not occur in the standard English dictionaries (as Johnson, Richardson, Halliwell), but Jamieson gives it as an Orkney name for "the short-tailed mouse," on the authority of Barry's Orkney, and suggests it may be derived from the Saxon *wold*. Baikie and Heddle merely cite the Orkney name as "*Vole*," or "*Vole mouse*." (Nat. Hist. Ork., 1848).

‡ The Field, vol. xvii., p. 729, and M.S.

* Prof. Bell observed it to be partial to insects in captivity.- British Quad. 325. Dr. Sharp, one of our foremost Scottish Coleopterists, has remarked that where voles are common beetles are scarce.—M.S.

" no harm, they again commenced their gambols, " without taking further notice of me. I observed " then, how greatly they vary in colour, from the " brown of a seal-skin jacket to a light fawn." A continental naturalist describes a colony of the species that he surprised in a wood in Switzerland, in somewhat similar terms. "Every instant I saw them flying " right and left, towards their holes; some would rush " headlong under a root, and thus disappeared for a " moment under the herbage and leaves, to emerge " further off and nearer their home, trying by these " little feints to baffle the pursuit of which they were " the object. Often, notwithstanding what Blasius " says, I have waited a long time near the opening " into which I had seen the animal enter, without its " being willing to show itself again. The underwood " had been drowned, so to say, by the previous rain, " yet these little creatures disported themselves freely " through it in open day. In their alarm they did " not hesitate to plunge through the marsh, or to " precipitate themselves into a hole, half full of " water."*

As a general rule the vole has three or four litters in a year, and produces from four to eight, but usually five or six at a birth. Several farmers and shepherds, however, in the hill districts believe that in mild seasons they are still more prolific, breeding five or six times, and rearing eight or nine young. In proof of this they state that in such abnormal years, the young mice are seen from February to November. Now, as the period of gestation of the rodents is only from three to six weeks,† and that of the vole is probably among the shortest, there is nothing improbable in the popular idea. And so with regard to the greater number of young produced and brought to maturity, the female being furnished with eight mammæ, and even occasionally more, she may easily rear the larger number under exceptional circumstances.

The interest excited by the swarms of field-mice that made their appearance in 1876 arose less from the unusual character of the phenomenon than from its bearing on the welfare of the hill sheep, and the profits of the farmer. To persons unacquainted with rural affairs the connection between the arrival of such puny visitors and the flocks that range the mountain slopes may not be very apparent. A slight sketch of the habits of the Cheviot sheep will show how disastrous such an invasion might have proved had it not been confined within comparatively narrow limits.

The hardy flocks bred on the higher Border hills retain much of their wild nature, and depend almost wholly on natural instinct in seeking their daily food. The flock or *hirsel* on a large farm forms itself into three, four, or more divisions called *cuts*, each keeping to its own range of pasture, and feeding gradually upwards to its resting place for the night near the top. If a stranger or other unusual object interrupts the even tenor of their way, the first to perceive the intruder stamps with its foot, and utters a sort of hiss, on which the whole *cut* takes the alarm, and runs off, but always keeping upwards.

During the summer months they range over the whole hillside within their limits, cropping the tender shoots of the heather, and browsing on the *moss*, *ling*, *deers-hair*, and other favourite grasses,‡ on which they thrive and become fat. As winter approaches, and vegetation slackens, the *bents* and stronger hill grasses become dry and sapless, and the sheep betake themselves to the *lay* or *lea* grasses, which, under the general name of *spret*, flourish on the land lower down. This lea land, perhaps once cultivated, or at any rate more sheltered, lies along the lower part of the valley, and borders the moist *bog* land, of which the more luxuriant growth had already been cut, and stacked for winter hay. These spots continue fresh and verdant till the frost and snow of winter render them also no longer available for feeding. The sheep are now reduced to considerable straits, and fall off in condition. Still they struggle bravely against the adverse elements, picking every blade that is visible, and even scraping the snow away with their feet, to get at the grass beneath. "At all times," says the Ettrick Shepherd, " when the ground is not covered with snow, sheep find " upon it sufficient fresh food." "I have often," he continues, "stopped in the middle of a flock in fields " half covered with snow, where no grass whatever was " to be seen. The sheep, however, having their eyes " nearer to the ground, perceived the point of some " leaves, and scratching with their feet to obtain more, " seized it with their teeth, even pulling up the roots " with their leaves."* The shepherd now comes to their assistance and doles out the bog hay, which had been stored for such a contingency, and this enables them to struggle on till herbage revives with returning spring. The earliest plants that appear, which are known by the vernacular names of *moss*, *ling*, *spret*, &c.,† then afford them welcome relief, until the luxuriant growth of summer restores them to plenty.

The importance of these early grasses to flocks emaciated by previous scanty fare, at a time when the ewes gravid with young, require more than ordinary nourishment to enable them to rear their lambs, explains how disastrous any diminution of their still scanty food might prove, whether from severity of weather or other unusual cause, such as the swarming of the voles.

Early in the year 1876, rumours were rife of great numbers of field mice having made their appearance on several of the hill farms. Soon more particular statements appeared in the local journals, and the subject was discussed at the meeting of the Teviotdale Farmers' Club in March and April.

* Hogg's Shepherd's Guide, 1807, p. 226. See too Sir John Sinclair's Observations on the Improvement of Wood, 8vo. Edin. 1792, where he calls the hill sheep "excellent snow-breakers, accustomed to procure " their food by scraping the snow off the ground with their feet, even " when the top is hardened by frost. They have never any other food " besides the grass and hay produced by their own hills." Page 66.

† For the identification of these local terms, I am chiefly indebted to Mr. Hardy. The references quoted are to Dr. George Johnston's Natural History of the Eastern Borders, 1853, Jamieson's Scottish Dictionary, Halliwell's Archaic and Prov. Dictionary:—

i. *Heather*, *He-heather*; CALLUNA VULGARIS. Sheep only eat it when it is young. It is, therefore, frequently burnt in spring. (Malcolm, in the Shepherd's Guide, p. 331). *Heath*, ERICA CINEREA and E. TETRALIX are called *She* and *Bell-heather*, and are not liked by sheep. (Johnston, 136.)

ii. *Ling*; ERIOPHORUM VAGINATUM. One of the earliest and most favourite grasses, eaten by sheep with great avidity, especially the roots. The first shoots and the flower stalks are generally known as *moss*. After flowering, the stalks are neglected, and the leaves which are then preferred are more properly *ling*. (Johns. 204.)

iii. *Moss*, as above stated, appears to be synonymous with *ling*, and so the Ettrick Shepherd uses it, p. 268. But Malcolm of Burnfoot, p. 331, says, "*Moss* begins to grow in February, and sheep eat it in the same manner as they do *ling*." Hogg also mentions "a short bluish grass, called *mossprie* or *sword-grass*," p. 268, perhaps *Molinia cærulea?* The term *prie* is applied to several kinds of grass, as will be shown.

iv. *Deers-hair*, SCIRPUS CÆSPITOSUS, appears rather later than the preceding kind, with which it is sometimes confounded. (Johns. 203–4.)

Bent is a generic term: "a coarse kind of grass growing on hilly ground," according to Jamieson, of which several sorts are distinguished by shepherds.

v. *Bent-grass* is AGROSTIS VULGARIS growing abundantly on drie pastures. (Johns. 211.)

vi. *Stool-bent*, *Rose-bent*; JUNCUS SQUARROSUS, common on all our moors, affording a good early bite to sheep in spring; they are said also to dig out the roots. (Johns. 199.)

vii. *Broad-bent*, *Flying-bent*; MOLINIA CÆRULEA, common on bog-land. (Johns. 212.) It soon dries, and the leaves are blown away by the wind. The sheep eat it for two or three weeks in spring, and then only sparingly, when nothing better offers, but it makes excellent bog-hay, and if cut early, is easily won.

viii. *Wire-bent*, *Black-bent*, NARDUS STRICTA, also applied to AIRA FLEXUOSA, abundant on the moors in summer. (Johns. 208.) It is useful when it first sprouts, but it soon dries and is then neglected by the sheep.

Spret, *spretty-grasses*, a general term for the succulent products o meadow or bog-land but chiefly for the different rushes (JUNCUS) which are cut for bog-hay. The word is variously written *sprat*, *sprcat*, *spret*, *sprot*, and has been derived from the Anglo-Saxon *sprauta*—a twig, but better from the Icelandic *sprott*, a reed. (Jamieson.) It seems also to be connected with *esparto*, the local name of MACROCHLOA TENACISSIMA, the leaves of which are so largely imported for making paper. *Spart* is rendered by Halliwell, "the dwarf rush of the northern counties," which Prior (Botanical Names of British Plants) writes *spart-grass* (p. 218 and *spurt-grass*, p. 221) SCIRPUS LACUSTRIS, the *bulrush*, deducing it from the Ang.-Saxon *Spyrtan*, which is from the Latin, *sporta*—a basket made of rushes, or from twigs of SPARTIUM —*broom*.

ix. The most common kind of *spret* is JUNCUS ARTICULATUS and its variety J. LAMPROCARPUS; a large constituent of bog-hay. (Johns. 199.)

x. *Bull-snout*, *Bull's-faces*, *Starr-grass* of some; AIRA CÆSPITOSA (Johns. 211); a valuable winter-grass, as none stand the frost so well.

Prye, *Pry*, is called "the bottom of *spret*," which alone is eaten by sheep when the *spret* gets old and hard. Several plants are included under this term, as:—

xi. POA TRIVIALIS; *Rough stalked Meadow-grass*, also called *Forked grass*. It forms one of the "Natural Grasses," as they are called, from the large share they contribute to meadow pastures. (Johns. 215.)

xii. HOLCUS LANATUS forms the bulk of the "*Bottom* or *Benty bog*." It is also called *Midge-grass*. (Johns. 212.)

xiii. CAREX PANICEA also is considered a *prye* grass, as are other species of CAREX, several of which appear to be confounded with other generic vernacular names (Johns. 207), but they are little prized as sheep pasture. This kind, however, stands frost well, and is so far useful in winter.

Specimens of a grass which was sent from Dumfriesshire as having been much destroyed by the voles, under the name of *Cocks-foot*, were afterwards corrected to *Starr-grass*. Of the two specimens received one

xiv. *Cockafoot* was found to be DACTYLIS GLOMERATA, which grows freely on *lea* land; the other, or *Starr-grass*, proved to be the AIRA CÆSPITOSA, already noticed as *Bull-snout*. (See No. x above.) The term *Starr* appears to be generic. Jamieson renders it by CAREX CÆSPITOSA; Halliwell by "Sedge, grass of the fens." In the Flora Scotica all the species of CAREX are given by Linnæus under [illegible]

xv. *Faircy* or *Fairey*, RANUNCULUS sp.: probably R. REPENS or R. BULBOSUS, was reported to have been greedily attacked by the voles.

* Victor Fatio: Les Campagnols du Leman, 1867, p. 18. J. H. Blasius in Zeitschr. f. d. Gesammten Naturwissenschaften, Berlin, 1857, Bd. ix. Heft 3, p. 161. Also Schinz: Fauna der Wirbelthiere der Schweiz, 1837, Bd. i. p. 432.

† Victor Fatio: Descr. de la Faune des Vertèbres de la Suisse, 1869. Vol. i. p. 432. Also Bell's Brit. Quad. 1874, pp. 290, 314, 325, 335, 354, &c.

‡ These names, and those that follow, employed by the shepherds, will be explained.

Appendix III.

So serious had the evil become that, on the latter occasion, a Committee was appointed to visit and report on the infested localities. At the same time the Club printed and circulated a series of queries, inviting replies from farmers, shepherds, and others likely to be most familiar with the matter.

The Committee accordingly inspected some of the farms, but they do not appear to have furnished a formal report. A sketch of it, however, prepared by one of the members, was printed in the *Hawick Advertiser* of May 13, which was accepted and discussed at the meeting of the Club on the 1st June following.*

The replies to the queries were not numerous, nor for the most part very exact. From all these sources, and from frequent private inquiries, the following particulars were obtained.

The district most seriously affected consists of a cluster of farms at the head of Borthwick water, which falls into the Teviot, three miles above Hawick. The centre of the group is Howpasley, which, with Craikhope, Wolfcleugh head, and part of Craik, all in the parish of Roberton, belong to the Duke of Buccleugh; adjoining them are Ramsay-cleughhead and Hislop, in the parish of Teviothead, and the estate of Tushielaw. Beyond them is Langshawburn; which was too close to escape such dangerous neighbours; as were other forms in Eskdalemuir parish; while several in Ettrick-head and Tema water were attacked in a greater or less degree, but not to be compared with the first-mentioned six farms. In Nithsdale and Western Dumfries, the parishes of Tynron, Penpont, and Durisdeer were among those that suffered most.

For two or three years previous to 1876, the voles had been observed to be on the increase. In the spring of 1875 the ground, which had been covered with snow since December, was found to be riddled with holes under the wreath-drifts, and denuded of herbage, by the voles that had found shelter there. Great numbers were seen throughout the summer, when cutting the bog hay. The shepherd at Craikhope described the children as "amusing themselves by "hunting them from morning to night, as long as "they could find nothing better to do, so that each "day," he believes, "they destroyed hundreds, and "the dogs devoured them, till they made themselves "sick!" In the autumn of the same year they continued plentiful. The farmer of Howpasley, "when cutting a four-acre field of corn, observed "numbers to be driven inwards by the reaping "machine, so when only a spot in the centre of about "20 feet by 5 remained, he made one of the men take "a scythe, and cut it slowly, a woman lifting behind. "The others surrounded them and killed the mice as "they came out; and somewhere between 80 and 100 "were thus destroyed, most of which were eaten by "six dogs present." "I used to kill scores of them," "he adds, "with a stick while walking over the "hills."

The same thing was observed in a greater or less degree, wherever the conditions of the ground were favourable to them. A correspondent to a county paper† relates that when "removing a two-years' "crop of hay in the autumn of 1875 from a meadow "sloping down to the Bowmont, on the farm of "Sourhope near Yetholm, two to four nests were "found under every rick, each with six to nine young "ones, the nest lying in a cavity from which runs "diverged in every direction. Great numbers were "killed by the boys assisting. One little fellow got 79 "full grown ones for his share, and his straw hat was "brimful of young ones."

Their numbers, already redundant, were augmented by the mild winter of 1875-6, and in the succeeding spring they made their presence felt in the doomed farms. During the three months from February to April they completely destroyed the pasturage of the bogland in Borthwick water, and were then driven to the *bents*. Notwithstanding the means used for their destruction, which, however, were not very skilful, the swarms showed little diminution. The public journals suggested a trial of the plan which had been so efficacious in the New Forest, where holes were dug into which they fell, but the hint came too late. More efficient auxiliaries appeared in the shape of hawks, foxes, weasels, &c., attracted by the abundant prey. Buzzards, which have long been strangers to the district, again made their appearance. A shepherd in Eskdalemuir saw seven of the rough-legged species (*Buteo lagopus*) on the wing at the same time, and the short and long-eared owls were observed in still larger numbers. By the middle of April the herbage was so much impaired that the voles themselves began to feel the want of food, and the occurrence of severe frost, with a sprinkling of snow, about the middle of the month, completed their discomfiture. Many died of starvation, and by the end of May they had mostly disappeared.

When the Committee of the Farmers' Club made their inspection, they found that fully one-third of the pasture in the places visited had been destroyed. The true bog-grass especially, on which the sheep mainly depend in April and May, had been eaten down to the roots. The ground was strewed with dried stalks and blades, mixed with tufts of fur, limbs, and other remains of the depredators. The sheep were in deplorable case. Several had died. The emaciated ewes, too weak to make good nurses, suckled their lambs with difficulty. Numbers of these had perished in consequence, and the survivors were poor and weakly.

On the return of the Committee, the causes of such an ususual visitation were discussed at the next meeting of the Club, on the 1st of June. Much weight was not attached to the popular explanation that it was owing to the destruction of vermin for the preservation of game, because no more hawks, owls, weasels, &c., had been destroyed than usual. More importance was attached to the absence of "black-frosts" during the last few years, which in a hard season kill the mice in their superficial holes. A curious coincidence was observed by one or two members, between the abundance of mice in some places, where moles had been well nigh extirpated, and their scarcity where these were plentiful, but this was disputed by others, and cases in which it did not apply were adduced. The second theory was the one most generally accepted, but at the same time an opinion was expressed, that "farmers and game preservers should be careful not to "destroy the natural enemies of the mice."*

The conclusion at which the Club arrived was, in the main, no doubt, the true one. But too little weight was attached to the two other explanations mooted. It may have been, and probably was, quite true that the destruction of vermin, for the protection of game, had not been greater of late than usual. The fact is, there was no occasion for it. So successfully has the war against birds and beasts of prey been waged for a long period, that as naturalists well know, several of the most useful indigenous species have been wholly or well-nigh extirpated.† The systematic destruction year after year of creatures like the weasel, stoat, owls, and hawks of every kind, which live in a great measure on rats, mice, "and such small deer," has been followed by the natural results. Their part in the economy of nature is to keep the smaller animals within due bounds. The removal of that check allows these to overpass their proper limits.

The doubt thrown on the other statement, that mice are rare where moles abound, and *vice versâ*, was due in part to an erroneous explanation advanced in support of it. Believing the short-tailed mice to be insectivorous, like the shrew and the mole, it had been supposed that they would thrive and multiply on the more plentiful supply of worms, &c., ensured by the removal of the latter, but this was contradicted by their decided preference for a vegetable diet. The statement, however, first broached, is not without

* It is appended as an authoritative document.

† Kelso Chronicle, 1877.

* Hawick Advertiser, June 3rd, 1876.

† The rooting out of raptorial birds has been followed by other ill results. Wood-pigeons have increased to a mischievous extent, and the grouse disease is attributed by competent judges to the same cause. The buzzard, besides devouring mice to a large amount, "is just the kind of instrument wanted," says Mr. Robert Gray (Birds of Scotland), "to "clear off sickly young birds, which, on arriving at maturity, yield a "degenerate offspring. Of somewhat sluggish habits, it does not care "to interfere with strong-winged birds, being content with those that "through wounds or a naturally feeble constitution, are unable to save "themselves. Thus strong birds only are left and a healthy breed is "secured."

The same may be said of other slow-flying kinds, as the marsh harrier and hen harrier (the name of which in Gaelic is *luch shealgair*, or mouse-hawk). These, with the useful glead, have entirely disappeared from the Border districts; and the kestrel, "that friend to the farmer," whose mouse destroying propensities are so well described by Waterton, is becoming rare.

Of quadrupeds, the harmless badger is no longer a denizen of our hills, among which the names of many spots, as the Brock-law, the Brockcleugh, Brockleburn, &c., survive to mark its former haunts. It is, however, still preserved at Mellerstain. But the polecat, marten, and wild cat are extinct, and the stoat is no longer numerous. A few sprinkling of weasels, which, in several parts of England, are called the *mouse-hunt*, or *mouse-hunter*, still continues to elude the vigilance of the keeper, but when seen they meet with no mercy.

foundation. Continental naturalists* include the mole among the enemies of the *Arvicolæ*, and an old esteemed member† of our own Club, distinguished for his accurate and intelligent observation of natural phenomena, sent the following results of his experience in a letter to a local journal, dated from Dunston Hill and Hedgeley, 15th July 1876:—"The natural enemy of the little rodent which has done so much harm in the Roxburghshire moorlands is the mole, which is a most voracious, carnivorous creature, preying greedily on its own kind (the stronger killing the weaker) whenever there is any deficiency of earthworms.

"The moles will, infallibly, keep the short-tailed mouse-vole in complete check, wherever the due balance of nature is not disturbed. The mole abounds up to great elevations upon the Northumberland moors, and, as a moorland proprietor, I should be very sorry to see it disturbed. It is a smaller variety than the mole of the low country. By throwing its casts upon the bent, and among the grass, in the boggy hollows, it tends beneficially to give a top-dressing, for as the Ettrick Shepherd, long ago, admirably explained, the sheep and lambs never fail to spread the mole-casts, and in the act of so doing, grind off the superfluous growth of their own hoofs. I never heard of a Northumberland farmer killing moles upon the moors, nor of a landlord fool enough to do it for him."‡

That the excessive propagation of the voles was due to the mild character of the four or five winters preceding 1876 is proved by the subjoined return of the temperature and general features of the winters from December 1870 to May 1876, obtained from the Scottish Meteorological Society,§ for which my best thanks are due to Mr. Buchan. They show unmistakeably that from February 1871 to January 1876 the temperature of the winter months was higher than the average, and attended with little frost. A slight exception is found in February 1873, and a more marked one in December 1874. But the frost in the former was slight, and in the latter was accompanied by much snow, which lay long and deep, giving effectual protection to the voles, as stated by several farmers and shepherds, who speak to the appearance of the ground under the wreaths, after it melted.

Thus favoured, they continued to prosper during 1875, and were prepared to pour fourth their swarms in 1876. The change of weather, which took place in April of that year, together with scarcity of food and the increasing assaults of their enemies combined to rid the district of their presence.

The opportune arrival of these useful auxiliaries must be accounted for by the same elemental conditions that promoted the increase of the voles, for it was not merely at the places where the latter appeared in such swarms that their advent was observed. It was noticed all over England.*

It is difficult to estimate the cost of the injury done to the farms which suffered most, because it must be be viewed under so many aspects. Thus, besides the loss of animals by death, allowance must be made for the impaired condition of the survivors, the diminished sale of lambs, draft ewes, and wool, the inadequacy of the rising stock to keep up the *hirsel* to its full-producing strength, &c.

One experienced agriculturist was of opinion that, on the 10,000 acres of the Borthwick water pasture which had been wasted to a greater or less degree, the damage could not be taken at less than 5,000*l*.

The foregoing statements refer only to the mischief done by voles in grazing grounds, but they have been found even more destructive in woodlands, the most familiar instance of which is that before referred to and described by Mr. Jesse as having occurred in certain new plantations made by the Department of Woods and Forests, in the Crown Lands of the New Forest, Hants, and Dean Forest, Gloucestershire, in the year 1814.

Shortly after they were formed, vast numbers of five-year-old oaks and chestnuts were eaten through, close to the ground, by field mice. They appear to have had a predilection for hollies, climbing up to a height of 5 or 6 feet, and stripping the branches after they had barked the stem. It was on this occasion that the plan of destroying them by means of holes dug in the ground was first tried with success. During the three or four months that the visitation lasted, it was estimated that upwards of 200,000 mice were destroyed, aided by the attacks of their natural enemies, and by starvation, which forced them latterly to prey on each other.†

About 1825 the oak coppices on the estate of Cameron, in Dumbartonshire, were attacked, without apparent cause, and the depredators were discovered by the successful adoption of the above expedient, which entrapped them in numbers.‡

The case of the Duke of Buccleuch's woods at Drumlanrig was brought before the British Association, at the Dundee meeting, in 1867, by Dr. Grierson, who had noticed the mischief to be annually increasing since 1852. The trees chiefly attacked were the oak and ash, the holly being a special object of attraction, but they spared the pines and the mountain ash. This

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* Fatio, Campagnols du Leman, p. 15.

† Ralph Carr-Ellison, Esq.

‡ The Swiss naturalist, Fatio, already referred to as having studied the habits of the vole with so much care, includes the hedgehog among the number of its enemies. Like the mole it is carnivorous, and doubtless preys on mice, while it does good service by destroying slugs, worms, &c., yet no animal is more ruthlessly persecuted by the keeper, who never fails to drive his heel into every one he sees. Fortunately for itself, however, it rarely comes out during the day, and so is by no means scarce. Being overrun with rabbits I employed two warreners to kill them, into whose unbaited traps 76 hedgehogs fell in 1877. They also, in like manner, unwillingly caught 363 rats, which threaten to become a worse enemy than either rabbits or voles.

The indictment against the hedgehog and the weasel of sucking eggs, is true to some extent; but is amply condoned by the service they render in destroying noxious creatures. The cock pheasant, as I myself have seen, does not scruple to peck the eggs of his mate, for which others, no doubt, bear the blame!

§ Winters in the South and East of Scotland during 1870-76:—

1870-1.

December, 1870. Temp. 3°.9 *below* the average; frost nearly every night from the 17th; the temperature falling to 5°, 12°, and again to 12° and 17°, which were the four coldest nights. Rain fell on the 14th and 15th to the amount of 1.34 inch. Snow fell in some places on 9 days after the 15th, and on the 30th 9 inches lay on the ground.

January, 1871. Temp. 2°.6 *below* the average, much frost during the month; 14° twice and 16° and 19° twice being recorded.

February. Temp. 4°.4 *above* the average; very little frost during the month. Rain from 3rd to 8th 2.17 inches; in some places more.

1871-2.

December, 1871. Temp. 0°.7 *above* the average; frost little. Snow a little on the first four days, and from 20th to 23rd.

January, 1872. Temp. 3°.2 *above* the average; little frost. Rain fell rather heavy. Snow on the 1st, 2nd, and 19th, to 26th; lying 3 inches deep in some places.

February. Temp. 8°.9 *above* the average; very little frost. Heavy rain from 20th to 24th, with snow from 19th to 28th.

1872-3.

December. Temp. 0.3 *above* the average, but fell several times below freezing, once to 18°. Rain in some places, on 8th, 17th, and 22nd.

January. Temp. 3°.9 *above* the average. Frost very little, temp. once falling to 18°. Rainfall heavy on 3rd, 9th, 16th, and 18th.

February. Temp. 1°.8 *below* the average. Hard frost on the 2nd, 3rd, 23rd, 24th, and 25th, temp. falling to 16°, 15°, and 19°. Little rain; but a good deal of snow fell from 1st to 8th, on 10th, and from the 22nd to the 25th.

1873-74.

December, 1873. Temp. 2°.9 *above* the average. Not much frost, and fell chiefly in the first half of the month, when snow fell at intervals.

January. Temp. 5°.9 *above* the average, with scarcely any frost, the lowest temperature being 27°. Rain fell on the first half of the month, and some snow from the 16th to the 22nd, and at the end of the month.

February. Temp. 0°.7 *above* the average; no continued severe frost, but temperature fell to 17° on the 11th. Little rain, some snow at intervals.

1874-75.

December, 1874. Temp. 8°.3 *below* the average. The month throughout was noted for continued hard frost, which was severe from the 22nd to the 25th, and again through the 30th, the temperature falling to 3°, and 5° below zero (-5°). The month was also remarkable for the great quantity of snow, and the frequency with which it fell over the whole country.

January, 1875. Temp. 5°.4 *above* the average, with very little frost, and little rain. Some snow fell at intervals.

February. Temp. 1°.3 *below* the average, but no continued hard frost, and very little rain. Snow fell from the 8th to the 10th.

1875-76.

December, 1875. Temp. 1°.1 *above* the average. Frost only from the 2nd to the 8th, the temperature falling on one occasion to 18°. Rainfall heavy from the 18th to the 25th, amounting in these days to 2.11 inches.

January, 1876. Temp. 3°.9 *above* the average. The thermometer fell to 14° on the 9th, but there was no continued frost. Rainfall small.

February. Temp. 0°.3 *below* the average. Frost rather sharp from the 9th to the 14th, and rainfall heavy at the beginning and end of the month. Much snow fell from the 2nd to the 15th; from 17th to 21st; and on the 24th and 25th, but did not lie.

March. Temp. 2°.3 *below* the average. Snow fell generally in the south from the 6th to the 22nd.

April. Temp. 1°.1 *below* the average. Snow fell from the 10th to the 13th with very severe frost. Thermometer ranging from 15° to 18°.

* The frequent capture of the rough-legged buzzard in 1877 has already been noticed (*The Field*, vols. xlvi., 504; xlvii., 158, 388; xlviii., 747; xlix., 488, &c. Club's Proceedings, vol. vii., 463, 510, and 524; vol. viii., 111, 139, 142, 155, 178, 190, 353).

Owls, too, were far more common than usual. The short-eared species in particular made its appearance in unusually large numbers. A correspondent of *The Field* states that flights of them appeared during the month of October, 1877, and on one day, the 17th, he saw them "perched on the rocks at low water, as many as ten at once, having just "arrived, and resting before making inland." Vol. xlix., 12, 44, &c.

Professor Newton writes, that in several recorded instances of the unusual occurrence of small numbers within the memory [illegible] "on a scale unknown [illegible] the sixty years [illegible] the greatest [illegible] [illegible] [illegible] and it would appear that the [illegible] "excites the powers which please passengers [illegible] "destructive horde. An additional fact of some interest was noticed "by Wolley, namely, that under such circumstances the owls seem to "become more prolific than usual," and he refers to instances of as many as 7 or even 10 or 12 eggs being laid in one nest. Yarrell's British Birds, by Alfred Newton, i., 103 (1872).

† Gleanings in Natural History, i., 166.

‡ M.S.

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continued till the trees were twelve years old, when they were generally safe.* Dr. Grierson had observed the same thing several years before on the estate of Maxwellton, in Glencairn parish.

In the letter quoted above, from Mr. Carr-Ellison,† he stated incidentally that he had "once nearly lost all "the beeches in a plantation where the ground had "been planted about three years, and was full of long "grass. The young beeches were eaten round just "above the earth, the sweet bark being entirely "stripped off."

In all these instances the voles exhibited a preference for deciduous trees (the holly excepted). But it is not always so.

In a graphic account of some plantations on the estate of Rannoch, in Perthshire, obligingly communicated by Sir Robert Menzies, he states that the pines only suffered, while the hardwood trees were spared. "In one instance 100 acres, and in another 40 acres "were planted in 1848 and 1855, with Scotch fir and "larch intermixed with oak, ash, plane, elm, beech, "and Spanish chestnuts. Early in the winter of "1863–4 the mice attacked the Scotch firs in both "plantations simultaneously, eating away the bark, "and sometimes the wood all round, as high as they "could reach, which, assisted by the heather and "long grass, was from six inches to a foot. The "Scotch firs only were attacked, and it was difficult to "distinguish those that were injured from those that "had escaped in the long grass, which concealed the "gnawed places, in this respect showing distinctly the "difference between the work of mice and that of "rabbits, the latter being visible at once."

After numerous attempts to get rid of them had failed the following expedient was adopted:—"In the "month of February half-a-ton of half-inch draining "tiles were laid down separately throughout the "plantations, and a tea-spoonful of oatmeal was placed "in each, which was soon discovered, and eaten by "the mice. Phosphorus paste was then added to "the meal, and latterly small quantities of arsenic. "The plan succeeded perfectly, and in a very short "time they were all destroyed. As food became scarce "the survivors began to eat their companions that had "been poisoned, and thus were poisoned in turn. "Their skeletons picked clean were found under the "grass in all directions. No dogs were poisoned, nor "did any other accident occur."

"Neither of the plantations have been visited by the "voles again, nor do the trees seem much the worse for "the severe thinning they have received, albeit not in "accordance with the rules of good forestry.

"I do not find," observes Sir Robert in conclusion, "that the field mice will eat young trees as long as "they can get grass and other natural food, for I have "a plantation at present at Ardlarich, in Rannoch, "planted in 1871, that is swarming with them quite "as numerously as the former ones, and not a tree has "yet been touched (1877) because the grass is still "plentiful, but should that fail, the tiles are all ready "for them."

It thus appears that the field vole, when pressed, will attack any edible vegetable substance, and it cannot be doubted that under suitable conditions it would be found to be as injurious to the produce of cultivated fields, as it has been to pasturage and woodlands. At the very time when it was proving so troublesome on the Borders, a closely allied species, the *A. arvalis*, of Pallas, was devastating the cornfields of Galicia and Hungary to an extent that attracted the notice of the Hungarian Government.

Some of the reports made to the Minister of Agriculture, Trade, and Commerce, in 1877,‡ have been procured through the late British Consul General at Buda Pesth, but being in the Hungarian language, their purport has only been partially ascertained. As with us, the voles were observed to be gradually on the increase from 1872, and from the same cause, viz., a succession of dry, mild seasons. In 1875 they were very numerous in the Kolozswar district, but it was in 1876 that they swarmed over the cultivated fields in such numbers that the peasants doubted whether they had sprung out of the earth or fallen from the clouds! They devoured every article of produce, whether grain or roots, corn, potatoes, turnips, lucerne. In the autumn of 1876 they attacked the vineyards, and when other food failed, devoured each other. Finally an epizootic disease broke out among them, which, at the end of 1876, swept them off in thousands. The dead were found to be covered with lice (*acari?*) which also infested the bodies of the living to a less degree.

By the spring of 1877 they had entirely disappeared almost as suddenly as they came, a result to which, in the opinion of the farmers, the heavy rains that fell at Christmas greatly contributed. When the ground was ploughed in the following spring, many mice were found dead in their holes, but by no means in proportion to their previous numbers. As was the case here, birds and beasts of prey were found of great service; and regret was expressed that their wanton destruction was not checked by law. It was remarked that the cats which ate the diseased mice were affected by a similar disease, and that numbers of them died in consequence.

The *A. arvalis* differs little from our *A. agrestis* (if indeed it be distinct) save in being of a darker colour, although this character is very variable. In one report, indeed, the description of those that devastated Transylvania coincides in every respect with the character of *A. agrestis*.†

Nor are such visitations matters of recent occurrence only. Did space allow, a curious and not uninteresting chapter of Vole literature might be collected from notices of their doings in times past among ourselves, supplemented by narratives of their depredations in other lands, as at Vienna, Magdeburg, Wurtemburg, and other parts of Germany.‡ I will content myself with quoting one or two instances by way of example.

In Stowe's Chronicle we read that "about Hallontide "last past (1581) in the marshes of Danesey Hundred, "in a place called South Minster, in the county of "Essex, * * * * there sodainlie appeared an infinite "number of mice, which overwhelming the whole "earth in the said marshes, did sheare and gnaw the "grass by the rootes, spoyling and tainting the same "with their venimous teeth in such sort, that the "cattell which grazed thereon were smitten with a "murraine, and died thereof; which vermine by policie "of man could not be destroyed, till at the last it "came to pass that there flocked together such a "number of owles, as all the shire was able to yield, "whereby the marsh-holders were shortly delivered "from the vexation of the said mice. The like of this "was also in Kent." Similar "sore plagues of strange mice" are recorded again in Essex in 1648, and at Hilgay, near Downham market, in Norfolk, in 1745.

I will conclude this part of the subject by referring to the oldest mention of voles on record. The earliest is that related in 1st Samuel, v. 6, when the Philistines having carried off the ark of the covenant, were plagued by an epidemic disease, and their fields ravaged by swarms of mice.§ The other is the statement of Herodotus (Euterpe. c. 141) of the invasion of Judea and Egypt by Sennacherib King of Assyria, and of the discomfiture of his army when encamped at Pelusium, on the frontier of the latter country, by swarms of field mice, "which pouring in upon the soldiers, de-"voured their quivers, bowstrings, and the handles of "their shields, so that next day when they fled bereft "of their arms, many were slain." The event was commemorated by a statue of Sethón, the Egyptian

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* Report of Brit. Asso. for 1867, pt. ii., p. 82.

† Supra, p. 4.

‡ 1. Report by the Royal Agricultural Institute of Keszthely.
2 " " Royal Agricultural College of Kassan.
3. " " Royal Agricultural College of Kulozs-Monostor, in the district of Kolozswar, &c.

† Since the above was written, the *Times* of the 12th July 1878 reports that considerable excitement prevailed in Moldavia, by the sudden appearance of a species of mole (? vole) about two inches long, at the village of Fundar, in the district of Tekatch, on the Sereth, which "has "already destroyed 120 acres of wheat so effectually that it was impossible "to tell what species of grain had been sown." A correspondent of the Society of Arts writes from Smyrna, in March 1878, that "they are "visited this year with the plague of field-mice, which have come down "from the mountains, and are eating up the seed-corn and everything "they can devour," and asks whether any remedy can be recommended. This called forth several replies, and among others a quotation from the *Globe*, suggesting that "The plagues of mice which have become a "terrible scourge in many parts of Germany and Austria are, in a great "measure, due to the practice of penning up the swine, instead of "allowing them the range of the fields as formerly. * * * * * It is no "unusual thing for a careful observer to detect pigs in the act of "snapping up full-grown mice, while they have a special fancy for the "nests containing the young, for which they have a keen scent, and "which they grub up and devour with avidity."—*Journal Society of Arts*, vol. xxvi., pp. 388–482.

‡ Prod. Faun. Vert. Hung. Sup. in Trans. Zool. and Bot. Soc. of Vienna, 1862; by L. H. Jeitteles, vol. xii., p. 245: Mammals of Germany, by J. H. Blasius, Brunswick, 1857: Illustrations of Animal Life, by A. E. Brehm, vol. ii., p. 152, 1865.

§ The Hebrew version from which our translation was made, seems to be incomplete at this place, for both the LXX. and the Vulgate read: "And the cities and fields in the midst of that region, produced mice "[or burst up, and mice came forth], and there was great confusion "and much dearth in the city;" which is confirmed by the 4th, 5th, and 11th verses of the next chapter (vi.) where the Philistines presented expiatory golden images of "the mice that mar the land" when restoring the ark.

King, in the temple of Vulcan, with a mouse in his hand, which Herodotus himself saw.*

Canon Tristram, who has investigated the Zoology of Palestine with much care, agrees with me in considering the agent in both these instances to have been *A. arvalis*, the commonest species in Syria.

The ubiquity of the field vole, ranging from the sea level to 4,000 feet of elevation in this country, and much higher in continental mountain ranges; their readiness to adapt themselves to such vegetable food as offers; their consequent diversity of habit, and the variations of size and colour observable among them when congregated in numbers, have given rise to a multiplication of species, established on specimens presenting only slight peculiarities. In the charming monograph of the Swiss *Arvicolinæ*, by V. Fatio, already referred to, these are reduced to five, each associated with numerous synonyms, as follows:—

1. *A. glareolus*, Schreber, 1775–92, with 13 synonyms. Illiger has formed it into a separate subgenus (*Hypudæus*) distinguished by the molars having distinct roots.
2. *A. agrestis*, Linn. Faun. Suec, 1746, with 10 synonyms.
3. *A. amphibius*, Linn. Syst. Nat. xii., ed. 1766, with 26 synonyms.
4. *A. arvalis*, Pallas, 1788 (the type *campagnol* of Buffon), with 13 synonyms.
5. *A. nivalis*, Martins, 1841, with 5 synonyms.

At the same time M. Fatio regrets that his limits preclude him from noticing other species in neighbouring countries, such as *A. rattieeps* and *A. campestris*, of Blasius; *A. subterraneus* and *A. savii*, of De Selys; and *A. socialis*, of Pallas, from the Volga.

These, with some others, have been formed into a subgenus or group, characterised by the smallness of the ear, and hence named *Microtus*, an exhaustive examination of which has been made by Prof. L. H. Jeitteles, in a paper read to the Roy. and Imp. Zoological and Botanical Society of Vienna, on the 7th of July, 1876, in which he comes to the conclusion that they all belong to one and the same species, inhabiting the plains, and to a considerable elevation the mountains of Central Europe, Italy, and Spain, and he is sure that they will be found also in Greece and Turkey. He attaches little value to most of the characters on which these distinctions were founded, such as the number of mammæ, the presence of additional ribs, the proportionate length of the tail, the defined separation of colour between the back and belly. The only constant mark that he recognises is the number of tubercles or pads on the sole of the hind foot, which are five in *Microtus*, and six in *Arvicola* (except in *A. amphibius*), but he does not rely on the spaces between the zigzag ridges of enamel and the number of their angles on the surface of the molars, on which the main specific distinction of the *Arvicolæ* appear to rest.

I cannot help thinking that too much weight is attached to this character likewise, and that a more extended comparison of many specimens would show these minute differences to be by no means constant. The distinction between *A. agrestis* and *A. arvalis* is supposed to lie in the second upper molar, but Fatio, himself, is puzzled by finding "une dentition mixte" in individuals of *A. agrestis*. He attributes these, and certain other divergencies, to "the effects of age, alimentation, season, and different conditions of level and habitat in which such individuals are forced to live" (page 71 and figs. 19, 24, 25 of Plate I.), but he considers that the constant form of the second upper molar covers all deficiencies.

Allowing this to be so, I cannot admit that it constitutes a structural character of sufficient value, on which to establish a species, and looking to the wide distribution of the field vole, to its identity of habit in every situation, and under very divers condition, I cannot bring myself to believe that *A. arvalis* is distinct from the species originally established by Linnæus, under the name of *A. agrestis*. Fatio arranges his true *Arvicolæ* as inhabiting plains (*Praticolæ*) or forests (*Sylvicolæ*), *A. agrestis* being the sole example of the latter, a fallacious distinction, for in this country it is more frequently found in meadows than in woods. *A. amphibius*, which stands among the *Praticolæ*, was at first separated from certain individuals living at a distance from water, which were formed into a distinct species by Linnæus himself, as *A. terrestris*, in contradistinction to *amphibius*, and it was accepted by Savi, Fred. Cuvier, Schinz, and others. It has also been recognised as inhabiting hills, and named *monticola*, but all have merged eventually into a single species as *A. amphibius*.

I feel justified, therefore, in concluding that *A. agrestis* and *A. arvalis* form but one species, which would stand under the name originally assigned to it in the *Systema Naturæ* of *A. agrestis*.

* Cory's Translation. The late George Smith, in the "History of Ancient Assyria from the Monuments," notices at p. 116, the correspondence of this narrative with that of the xxxvii. chap. of Isaiah, and in Chron. xxxii., 21.

Sketch of proposed Report of the Committee of the Teviotdale Farmers' Club, referred to at page 3.

For some time back occasional notices have appeared of the ravages of mice on some of the pastoral farms of upper Teviotdale and adjoining districts, and perhaps the matter has received less attention than it deserved, owing to the impression that the accounts were exaggerated, as a scourge of the kind was to any serious extent a novelty in the stockmaster's experience. At the last meeting of the Teviotdale Farmers' Club at Hawick, however, some conversation took place on the subject, and such testimony was borne by eye-witnesses of the destruction of the pastures by the vermin as led the members of the Club to believe that the evil was of sufficient extent and character to justify some inquiry regarding its cause, with the view of endeavouring to devise a remedy. A committee of the Club was accordingly appointed to inspect some of the most severely infected hill farms, and in order that perfect impartiality might be secured, some lowland farmers who had not suffered from visitations of the mice, and other gentlemen unconnected with agricultural pursuits, were nominated on the committee, with other members having large pastoral holdings.

The infected district extends generally over the lands adjoining the watershed between Teviotdale and Eskdale and Liddesdale, but on some farms the damage is only to a limited extent. The committee resolved to visit one or two where the greatest mischief was reported to have been done, and the farm of Howpasley at the head of the vale of the Borthwick was selected for a beginning. Howpasley is a large farm in the parish of Roberton, the most westerly parish in the county. The farm forms part of the southern boundary of Selkirkshire, where it marches with Craik in the latter county, and also of part of the eastern boundary of Dumfriesshire, where it marches with Moodlaw in Eskdalemuir. It has for two leases been farmed by Mr. James Oliver, whose stock and wool have always ranked high in the market. Craik, which has also suffered greatly by the mice, is tenanted by Mr. John Moffat, another well-known breeder of Cheviot sheep. Contiguous to these farms, to the west of them, and also reaching to the boundary lines of Selkirk and Dumfriesshire are Wolfcleughhead and Craikhope, tenanted respectively by Mr. Robert Govenlock and Mr. Bell of Castle Orr. The quality of the stock on their holdings has likewise enjoyed high reputation, and they are in a similar plight as regards the invaders of the pastures. All the four farms are the property of the Duke of Buccleuch.

The committee first visited Howpasley a few days ago, and were shown over the farm by Mr. Oliver, jun., and Mr. Moffat, Craik. Mr. Moffat stated that the scourge had not come suddenly upon them, for the mice had been steadily increasing in numbers, and in the extent of their devastation during the past five years. They had so thoroughly consumed the pasture which should be ready for the sheep in the spring months on the lower and more sheltered grounds, that these were now abandoned by them for higher regions, where the work of destruction was still in active progress. This was quite borne out by the inspection of the lower slopes on Howpasley Hill. There the pasture is known by the name of "true bog," and the grass destroyed by the mice is in the shepherd's vocabulary called "spret." It is much relished by the sheep in April and May, and at the time of the committee's visit should have been about two or three inches long, and of fresh green colour, affording a full bite till the later grasses come to maturity. In many places, however, there are no traces of its existence as a living plant. Instead of green herbage, there are large tracts covered with dead grass, the tops of the plants cast aside by the vermin. Where it can be seen, the young shoots are just beginning to appear above the ground, the tops bearing unmistakeable signs of having been nibbled. The mice eat it at the white part just above the root, and though they do not in every case entirely

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destroy its vitality, they so retard the progress of the grass that it is not forthcoming at the season when it is most in request by and indeed indispensable to the healthy condition of the sheep. But perhaps the most striking evidence of the mischief is found in the thick grass bushes known as "bull snouts." An application of the hand or foot to these shows that their weight only keeps them in their places, the vegetation connecting them with the soil being completely severed by the mice. On removing them the bare earth and withered stalks and roots are alone visible, varied here and there by the reviving nibbled shoots already alluded to. All around, too, are traces of the retreats where the depredators retire in the hour of danger, the surface of the ground being literally riddled with holes, and presenting much the appearance of ground in the neighbourhood of targets for rifle practice. On repairing to the higher lands and among the "bents," where the mice are now at work, similar evidences of their presence are to be seen, though the havoc made there is not yet quite so considerable. It is conjectured that they may not so much relish the food they get at the greater altitude, but it is quite sufficient to sustain them till, if unchecked, the more favoured pastures are again in readiness for them. The committee next visited Craighope, where the same disastrous state of matters was apparent, and the mischief is pretty equally distributed over the four farms mentioned.

It is not too much to say that the vermin have destroyed 30 per cent. of the grass which should now be available for the sustenance of the sheep. At any time this would be a serious matter, but in the lambing season it is peculiarly unfortunate, especially in a year when "lingering winter chills the lap of May." The ewes are in such poor condition that they have little or no milk for their lambs, which, brought sickly to the world, are perishing in large numbers, and unless the unlicensed depredators of the pastures can be extirpated, a considerable reduction of the numbers of the flock must be resorted to as a prudential measure.

The committee saw a few of the vermin on the uplands, but, quick of sight and hearing, they made for their holes so rapidly that it was with difficulty one or two were captured. They do not in all respects resemble either the house or the ordinary field mouse. They are from three to four inches long, with a short stumpy tail, have bright piercing eyes, and large ears almost level with the fur. They are brown-coloured on the back and ash-coloured on the belly. The stomach apparently contained vegetable matter only. This of course may be held as disposing of one theory set up by some experienced shepherds for the great increase of their numbers on the hills. The mole—long a pest against which the pastoral farmer has made war—has now been so nearly stamped out in the district that only a brief annual visit of the mole-catcher is needed to keep it from doing appreciable damage. Some shepherds have conjectured that the food of the mole, consisting of snails, worms, and various members of the insect tribe, having multiplied in absence of the enemy, the mice have been attracted by, and thriven on, the abundance of animal food thus left in store for them. But if it can be established that the mouse of the hills does not feed on the same diet as the mole, and when they can be had prefers the tenderest tit-bits of rich succulent grasses, it is clear no such inducement was required to bring them to the upland pastures.

A more plausible theory is that the mice have increased and multiplied owing to the absence of their own natural enemies, such as weasels, owls, and hawks. The gamekeeper is, in his turn, the enemy of such beasts and birds of prey, which destroy the game in the egg and when the birds are young in preference to animals of inferior order. But in the district visited by the committee no complaint is made that the keepers have been more than ordinarily active in killing the natural ravagers of the game crop. Still, the best remedy for the plague of mice will probably be found in the importation to their haunts of greater numbers of their natural enemies, even though the game should, to some extent, pay tribute to the counteracting influences. In some parts of Eskdalemuir, where the mice have also done considerable damage, it has lately been noted that the owls are increasing in numbers. It is likely that the instinct of the birds of prey will direct them over the watershed, and they will be heartily welcomed by the farmers on the Roxburghshire border. Round the farmhouses of Howpasley and Craik there are dense fir plantations, which would prove most desirable day retreats for the owl, and the abundance of food awaiting it would make the region quite a paradise for the solemn bird of night. Then the erection of a few stone cairns here and there on the farms would afford accommodation for weasels, which would undoubtedly enjoy an abode in such plentifully stocked hunting-grounds. The cat is all very well in its place, the dwelling-house, the stable or the granary, but it could not be induced even by the presence of great spoil to domesticate itself on the breezy hillsides of Upper Teviotdale; while traps would require to be very temptingly baited to compete with the sweet grasses of which, unfortunately for the farmers, the mice have shown themselves so fond. Besides, when an enemy has to be counted by millions, trapping could not very considerably mitigate the evil. Poisoning has been suggested as a cure, but the poison would require to be very carefully protected by placing it in the runs of the vermin, or surrounding it with wire netting, as if other animals besides those for which it is intended were to get access to it the cure would be worse than the disease.

The committee in reporting the result of their investigations to the Club will probably suggest what appears to them the most effective remedy, and it is understood that some of the members will take the advice of skilled naturalists on the subject. On one essential point they are agreed, that the plague of mice is an evil of severe magnitude to the farmers where the pest prevails, and that if possible some remedy should be found and applied without delay.

One of the members of the Club's committee, a large pastoral farmer, and who has himself partially suffered from the incursions of the mice, gave it as his opinion that they had been nourished to their present strength and means of mischief doing by the peculiar character of recent winters. For four or five years back there has been no black frost on the hills. Frosty weather has prevailed, and sometimes been of long duration, but it has always been preceded by heavy snowfall, which has kept the mice in life all winter; whereas, were the ground unprotected by snow, a keen frost would penetrate into the earth as deep as their holes, and destroy them, if not entirely, at least in great numbers. Their holes are not more than six inches deep, for they are indifferent burrowers, and the frost would bind the earth as far as that. The only difficulty the committee had in reference to this theory was the doubt that the frost, however keen, would reach to the utmost verge of the retreats of the mice.

APPENDIX IV.

FOREIGN CORRESPONDENCE.

FRANCE.

Translation of Note received by the Board of Agriculture through the Foreign Office from the Ministry of Agriculture, Paris, dated May 7th, 1892. Handed in by Major Craigie, see Evidence, Q. 51-52.

To his EXCELLENCY the AMBASSADOR,

IN reply to the inquiry which your Excellency has been good enough to address to me, as to whether there have been invasions of field mice in France which have damaged the crops by ravages similar to those now being experienced in the south of Scotland, and as to whether the French Government are cognisant of any remedies for dealing with the plague (of mice) I hasten to inform you that at different periods there have been visitations of mice and voles in various parts of this country, and that, in connection with this subject I have issued instructions to the professors of agriculture recommending a remedy, which had been employed with excellent results in Mayenne.

I send you a copy of these instructions, and I have reason to believe that the methods therein described might be usefully applied in this case.

I am, &c.
(Signed) J. DEVELLE.

TRANSLATION of a CIRCULAR issued by the FRENCH MINISTRY of AGRICULTURE to the DEPARTMENTAL PROFESSORS of AGRICULTURE.

SIR, Paris, November 29, 1890.

I AM informed that in numerous districts there has been a repetition of the damages to crops caused by voles and mice. The agricultural population is alarmed by the ravages committed by these rodents, and I have recently received numerous representations on this subject.

I consider it necessary to draw your attention to the following method of destruction which has been employed with success for several years at the École pratique d'Agriculture de Beauchêne (Mayenne):—

"A mixture of $\frac{4}{5}$ths flour and $\frac{1}{5}$th arsenic is introduced by the aid of a small palette knife into the middle of a drain pipe with an internal diameter of about three centimètres (about $1\frac{1}{4}$ inches), and this pipe is then put near the holes of the mice."

This procedure is simple and inexpensive, moreover by its adoption domestic animals and game are not exposed to the danger arising from an absorption of the mixture, I think, therefore, that experiments should be made.

I invite you, accordingly, to visit the localities in your department which may be afflicted by the ravages of the rodents, and to make known to the inhabitants, by the medium of lectures, the method of destruction which I have just described, and from which I have reason to believe they may expect the best results.

Please acknowledge the receipt of this circular and inform me later as to the results which will have been obtained.

I am, &c.
(Signed) JULES DEVELLE.

NORWAY.

Correspondence received by the Board of Agriculture from Her Majesty's Minister at Stockholm, dated May 31, 1892, handed in by Major Craigie, see Evidence, Q. 64.

MY LORD,

WITH reference to your Lordship's despatch, No. 21, Commercial, of the 11th instant, I have the honour to enclose copy of a despatch which I have received from Her Majesty's Consul-General at Christiania respecting the periodic attacks of the "Lemming" in Norway.

I have, &c.
(Signed) F. R. PLUNKETT.

The Marquis of Salisbury, K.G.

(*Enclosure.*)

No. 26.

H.B.M. Consulate General, Christiania,
SIR, May 27, 1892.

WITH reference to your despatch of the 14th ult. I have the honour to report that I have caused inquiries to be made, and have received the following information from Professor R. Collett, Conservator of the University Museum of Christiania—

1. The circumstances attending the plagues of lemmings in Norway differ very materially from those connected with the present mice plague in Scotland. The lemmings are usually found upon the mountains at an elevation of 2,000 or 3,000 feet, and when they migrate to the valleys it is to die there, for they never return to the districts from which they proceed originally.

2. Their visitations are probably caused by want of sufficient food in the mountain lands from whence they come.

3. Their attacks are short and insignificant.

4. No measures have been adopted by the Norwegian Government, or by private persons to resist their attacks, and from the nature of the places which they inhabit, and the remarkable migratory habits of the animals themselves, it would be extremely difficult to adopt any measures likely to prove effective against their inroads.

Professor Collett is therefore of opinion that the attacks of the lemmings in Norway cannot be compared with those of field mice in Scotland, and he also thinks that perhaps some useful information regarding the mice plague might probably be obtained in Germany, where such plagues frequently occur.

The attacks of these mice, Mr. Collett states, usually commence weakly the first year, increase to an enormous extent in the second, and cease from natural causes in the third. He is of opinion that nature has provided a remedy against the attacks of the lemming by afflicting them with a disease which decimates their numbers so soon as they increase to an alarming extent. Something of the same kind, he thinks, will probably occur among the mice in Scotland.

Among other articles which have been written upon the lemming may be mentioned one by Professor Collett in the Linnean Society's Journal of Zoology, Part 13, and in a paper in the Proceedings of the Zoological Society of London, dated November 3rd, 1891, by Mr. T. T. Somerville of Christiania.

I have, &c.
The Hon. (Signed) T. MICHELL.
Sir Francis Plunkett, K.C.M.G.

GREECE.

Précis of Information received by the Board of Agriculture on the subject of the Plague of Field Voles in Greece, handed in by Major Craigie, see Evidence, Q. 66.

A despatch dated the 21st of March 1892 was received from Her Majesty's Consul at the Piraeus reporting that the province of Thessaly was invaded by swarms of rodents of a species designated "Arourai," but no doubt actually *voles*, the letter erroneously called them rats, probably from the form of the head of the animal, which has a rounded instead of a pointed muzzle as in the true *muridæ*. The localities most affected were Delihanis, Kalinga, and in a lesser degree, the plain of

Appendix IV

Phersala. Veterinary surgeons were despatched to the spots to devise means of extirpation. Poisoning was suggested, but with that method there was always a fear lest other life, animal as well as vegetable, should suffer as well.

On the 19th of April the Consul reported that the voles had already destroyed about 200 acres of young corn, and that the Grecian Government had despatched three professors from the agricultural schools to superintend the extermination of the devastators. The remedies adopted for their destruction consisted of flooding the holes where sufficient water was forthcoming, and of injecting carbon bisulphide into the same with the aid of a suitable apparatus. Unfortunately, the supply of this became exhausted, and it was feared that a considerable time would elapse before a further supply could be obtained, as vessels refuse to carry so inflammable a substance.

On the 19th of April Count Demetrius Mercati of Zante, Ionian Islands, wrote to the Foreign Office and referred to the prevalence of the mice plague in Scotland. He intimated that the most successful remedy employed by the Greek Government against a similar plague was carbon bisulphide, which was most conductive in stamping out the scourge.

This remedy appears to be a highly inflammable liquid with a most repulsive odour. Injections into the holes and runs by a suitable apparatus would probably destroy the mice.

On the 29th of April the Board of Agriculture requested the Foreign Office to obtain detailed information as to the steps which were being taken to deal with the plague of voles in Greece and certain other countries.

On the 11th of May Count Mercati again wrote, and informed this country that the system of Professor Loeffler of Berlin had been most successfully applied in Thessaly against the plague. The remedy was stated to be less expensive than the bisulphide of carbon process.

On the 12th of the same month Her Majesty's Minister at Athens in reply to the inquiries made by the Foreign Office wrote to say that the mice plague in Greece was practically at an end. The newspapers appeared to have exaggerated its importance. The extermination of the mice was effected partly by the use of ordinary poisons and partly by Dr. Loeffler's process. It was also greatly assisted by an opportune and heavy rainfall.

Dr. Loeffler's system consists in communicating to the mice a form of typhus peculiar to such animals by means of food impregnated with the bacillus of that disease. Bread steeped in a liquid containing the bacillus and sweetened was placed in the holes during the day so that the mice should find it when they came out in the evening to feed. The disease took about six or eight days to develop. It was not contagious, those mice alone suffering from it which had actually eaten the prepared condiment. To other animals it was absolutely innocuous. Other poisons were used, more rapid in their effects but of greater risk to other living creatures, but precaution was nevertheless taken to place the prepared food underground instead of scattering it about.

On receipt of this despatch the Board of Agriculture felt it desirable to ask replies to certain further questions in order to obtain fuller details on particular points.

On the 8th of June Her Majesty's Minister at Athens notified that he had at once caused a copy of this Schedule of Questions respecting the method of exterminating Field Mice, forwarded by the Board of Agriculture, to be communicated to Monsieur Gennadius, the Director of the Department of Agriture, in the Greek Ministry of the Interior, in order that he might reply to them. Monsieur Gennadius, however, was absent from his office on a tour of investigation into a vine disease, and Her Majesty's Minister, therefore, meanwhile transmitted a translation of an article in the "Acropolis" newspaper purporting to record an interview of its correspondent with the Director of Agricultural Schools in Thessaly, as containing useful information.* This article tended to show that Dr. Loeffler's system was inoperative, chiefly owing to the prejudice of the peasantry, who hid the prepared condiment, fearing lest it should also destroy cattle and sheep. Moreover, inoculation by the doctor's system was said to be an entire failure, and in this way: although the inoculated mice died, the uninoculated having abundant food to eat did not devour the carcases of the inoculated, nor did the latter become mad, and so bite and destroy the others. The method most in favour with the peasantry was injection of "carbon bisulphide," the result being immediate. The moment the injection is introduced into the nest of voles the animals die from asphyxia almost instantaneously.

On the 9th of June Her Majesty's Ambassador at Paris, at the request of Sir E. Monson, procured and sent a copy of the "Journal d'Agriculture Pratique," which contained an account published by Monsieur Gennadius of the mice plague in Thessaly and of Dr. Loeffler's method of destroying the animals. [*See* next page.]

On the 22nd of the same month Her Majesty's Minister at Athens transmitted the following replies to the Schedule of Questions on the Thessalian Mice Plague forwarded by the Board of Agriculture:—

Mice Plague in Thessaly.

Question 1. Is the "Arvicola agrestis" or "Arvicola arvalis" the true scientific name of the particular species of field-mouse or vole which has ravaged the crops in Thessaly, and whether the same animal has been previously reported to have caused like damage?

Answer. It seems that the species of the "genus arvicola" are not quite clearly defined. The species existing in Thessaly is probably the "Arvicola savii," a species indigenous to southern countries. The same species of "Arvicola" appeared in great numbers in Thessaly in 1866.

Question 2. Nature of land affected, whether rough hill land, moor, cultivated pasture, or arable land, and the specific varieties of *grass* or *grain* consumed by these voles?

Answer. Hitherto the voles have confined their ravages chiefly to the uncultivated lands; they have done very little damage to the wheat and barley fields.

Question 3. Area of land affected (approximately)?

Answer. They made their appearance in nearly all the *nomos* of Larissa, but chiefly in the neighbourhood of Larissa, Pharsala, Pheræ, and Holmygros.

Question 4. Particulars noted respecting the origin or causes of, and the duration of the plague, with dates of commencement?

Answer. In all probability this vole is indigenous to Thessaly, and it multiplies to excess after an abundant crop (like the recent crop in Thessaly) and a mild and comparatively dry winter.

Question 5. What number of remedies has been adopted for combating the plague, and over what areas and during what period of time has each been tried, and whether by official or private persons.

Question 6. What is the relative degree of success which has accompanied the application of each remedy, and how far can the operation of each remedy be distinguished from the relief effected by natural causes, such as the recent heavy rainfall.

Answer 5 and 6. The methods adopted, as well as their respective results, are enumerated in the "Journal d'Agriculture Pratique" of May 19th, 1892 (page 706), which I have had the honour to send to the Legation. Heavy and continued rains destroy the voles. The recent rains in Thessaly were not sufficient, however, to produce this effect.

Question 7. Have birds of prey assisted to any material extent in the destruction of the voles, and if so what species of birds proved the most destructive?

Answer. Birds of prey and other rapacious animals would never suffice to prevent the alarming multiplication of the voles under favourable climatic conditions.

Question 8. Can further explanation of the details of Dr. Loeffler's system as applied in Thessaly be given with exact medical terms, and can an estimate be formed as to the precise material effect of this remedy as distinct from any other in extirpating the mice?

Answer. Dr. Loeffler's method is described in the above-mentioned number of the "Journal d'Agriculture Pratique." It is given in more detail in the "Centralblatt für Bakteriologie und Parasitenkunde" XI. Band, 1892, No. 5 (edited by Dr. A. Uhlworm in Cassel. Verlag von Gustav Fischer in Jena). (*See* Appendix VI.)

Question 9. Is the poison or disease germ introduced by Dr. Loeffler dangerous to other animals in itself, and are the bodies of the dead mice liable to injure any other animal eating them?

Answer. Dr. Loeffler's virus is specially prepared for the *muridæ*, and no other animal, at least up to the present time, has been attacked by the virus.

* Copy forwarded to Mr. Harting, Secretary of Field Vole Committee.

Question 10. Can details be given as regards the cost of Dr. Loeffler's and of the other systems of poisoning referred to, and by whom were the expenses defrayed?

Answer. Once the virus is obtained, the expenses incurred in its application are merely nominal, and do not exceed those incurred in the use of poisons. The virus is to be obtained from Dr. Loeffler.

On the 30th June Her Majesty's Minister at Athens transmitted further information afforded by Monsieur Gennadius. It appears that Dr. Loeffler received no remuneration except 2,000 florins in gold for travelling expenses, and 300 drachmas (12*l.*) for his expenses in Thessaly. The expenses of the measures adopted against the mice were defrayed partly by the State and partly by certain communes and by two committees of proprietors at Volo and Larissa. The State contributed most of the materials used and paid the salaries and expenses of the superintending staff (Dr. Loeffler and the "Lyronomes"), amounting to from 800*l.* to 1,000*l.* The communes and committees paid the wages of the labourers, viz., from 800*l.* to 1,200*l.* The Thessalian Railway Company allowed gratuitous circulation on their lines both to men and materials.

On the 9th July the Board of Agriculture received through the Foreign Office a further despatch from Athens, dated 28th June, and enclosing a glass tube containing some of Dr. Loeffler's virus, prepared in the bacteriological laboratory of the University of Athens. M. Gennadius, who sent this to the British Legation, stated that the virus could be kept in the tube in good condition for several months, and that it could be preserved and multiplied indefinitely by a bacteriologist. The tube containing the virus was sent by hand to the Secretary of the Field Voles Committee on July 9, 1892.

EXTRACT from an ARTICLE by Dr. GENNADIUS, DIRECTOR of the DEPARTMENT of AGRICULTURE in GREECE, entitled "LES CAMPAGNOLS EN THESSALIE," published in the *Journal d'Agriculture Pratique*, 19 March, 1892. Handed in by Major CRAIGIE, *see* Evidence, *Q.* 64, 71.

LES CAMPAGNOLS EN THESSALIE.

Les campagnols de la Thessalie paraissent être indigènes et appartiennent, selon toute probabilité, à l'espèce de Savi (*Arvicola* ou *Microtus Savii*). Pendant l'hiver et au commencement du printemps ils occupent les terrains hauts, secs et incultes; ils descendent vers les parties plus basses et cultivées aussitôt que celles-ci commencent à se dessécher. Ils apparaissent toujours en grand nombre après des récoltes abondantes (comme nous en avons eu en Thessalie l'année passée), qui favorisent leur pullulation, et les hivers doux et sans pluies torrentielles. Les pluies abondantes concourent à leur diminution et souvent à leur extermination.

Vers le commencement du mois passé, nous avons appris l'apparition en grand nombre de ces rongeurs dans la Thessalie orientale, et aussitôt nous avons ordonné aux autorités locales de recommander aux agriculteurs l'emploi simultané des moyens suivants: 1° les appâts empoisonnés par l'acide arsénieux; 2° les pièges (pots en grès et, dans les terrains argileux, simplement des trous); 3° les fumigations de soufre, etc.; 4° l'introduction des porcs dans les terrains incultes; 5° les inondations partout où on dispose de l'eau courante; et 6° les injections de sulfure de carbone moyen que, pendant l'été de 1890, nous avons essayé avec un plein succès contre les souris de jardin dans les pépinières de l'Ecole d'agriculture d'Athènes.

La direction de la lutte et l'emploi du sulfure de carbone, nous les avons confiés à trois de nos jeunes agronomes, accompagnés d'un certain nombre d'étudiants de nos écoles d'agriculture.

De tous ces moyens, le plus efficace et le moins coûteux est, sans contredit, l'inondation.—Là où il y a de l'eau courante, on se débarrasse facilement des campagnols—mais, malheureusement, ce moyen ne peut s'appliquer que sur des surfaces très limitées à cause du manque d'eau. Viennent en seconde ligne, au point de vue de l'efficacité et de l'économie, les appâts empoisonnés. Ceux-ci deviennent fatals aux campagnols sans être nuisibles aux autres animaux, s'ils sont mis directement dans les trous des nids, qui sont ensuite bouchés, ou dans des drains posés auprès des nids et ayant un diamètre de 3 à 5 centimètres. En troisième lieu vient le sulfure de carbone dont l'emploi, quoique très efficâce, est pourtant très cher. Assez efficaces aussi ont été trouvés, partout où on les a employés en temps et avec persévérance, les pots-pièges en général et de simples trous dans les terrains argileux. En Angleterre, par exemple, avec de simples trous on est parvenu à se débarrasser des campagnols qui, pendant plusieurs années, détruisaient la forêt de Dean. En Thessalie, au lieu de pots en grès, on a employé, avec autant de succès, les pots en ferblanc dans lesquels on nous envoie d'Amérique le pétrole.

Mais quoique tous ces moyens, bien et en temps employés, fussent suffisants pour détruire les campagnols apparus, nous avons voulu faire l'épreuve d'un autre procédé, tout nouveau, non encore essayé ailleurs et indiqué au ministère par notre légation à Berlin.

Comme on le sait, M. Pasteur a, le premier, proposé de combattre les bêtes nuisibles à l'agriculture par les maladies épizootiques. C'est le moyen que l'illustre savant a indiqué aux Australiens pour se débarrasser des lapins qui dévastaient leurs champs, en inoculant à ces rongeurs le choléra des poules. Pourtant ce remède, pour une raison ou une autre, a complètement échoué et, par conséquent, il a été abandonné en Australie. Mais cet échec, ainsi que d'autres analogues, n'ont pas découragé les savants qui, depuis quelques années déjà, cherchaient à découvrir des microbes spéciaux et à perfectionner les moyens de les utiliser contre les différents rongeurs et insectes nuisibles à l'agriculture.

Ainsi M. le docteur Loeffler, professeur d'hygiène à l'Universite de Greifswald, dans le cours de ses recherches, a tout récemment découvert et cultivé le bacille du typhus des muridés (*Bacillus typhi murium*), mais ses expériences et recherches sur l'efficacité et les effets pratiques de l'emploi de ce bacille contre les campagnols consistaient seulement en travaux de laboratoire. Pourtant nous n'avons pas hésité à prier M. le docteur Loeffler de venir chez nous essayer sa méthode sur les champs de la Thessalie infestés par ces rongeurs.

M. le docteur Loeffler en arrivant ici a vite compris que, par les inoculations hypodermiques, qu'il avait tout d'abord l'idée de pratiquer, la transmission du mal serait très lente—sinon nulle—pour produire un effet apparent avant que les campagnols eussent détruit toute la récolte de la Thessalie. Il a donc eu recours aux appâts infectés ainsi qu'il suit.

Dans une infusion de paille contenant une petite quantité de peptone, de sucre, de sel et de soude, il dissout la gélatine dans laquelle est cultivé le bacille du typhus des muridés. Vingt-quatre heures suffisent pour que toute la masse du liquide se remplisse de bacilles. Dans cette infusion il trempe des morceaux de pain dont il jette un ou deux dans chaque trou de nid. Les campagnols, cachés toute la journée dans leurs nids, ne sortent ordinairement que vers le soir, quand tout est tranquille au dehors; alors la première nourriture qu'ils recontrent sur leurs pas est le morceau de pain infecté qu'ils mangent volontiers. L'effet de cette infection directe se fait attendre presque dix jours, aprés lesquels, sur les champs ainsi traités, on peut trouver plusiers campagnols morts ou mourants.

Comme on le voit, la méthode est simple et facile à appliquer, et comme la maladie par laquelle on combat les campagnols est spéciale aux muridés, on ne risque pas qu'elle soit transmise à d'autres animaux par les cadavres de ces rongeurs ou par les appâts mêmes.

M. Loeffler prétend que la contagion se transmet indirectement aussi, c'est-à-dire par le contact au moyen des excréments, etc. Que les excréments des campagnols attaqués de typhus contiennent les germes de cette maladie, personne ne pent le contester; mais je doute que ce fait puisse avoir une valeur pratique; je doute que la contagion puisse se transmettre indirectement au milieu des champs et du grand air où les campagnols vivent, et au moins pendant l'époque (mars à octobre) où ces rongeurs, en cherchant et trouvant facilement de la verdure abondante, se déplacent souvent en laissant derrière eux les champs dévastés et infectés. D'ailleurs, nous n'avons pas encore des observations qui permettent d'affirmer cette transmission indirecte dans les champs: au contraire même, les expérieuces faites en Australie réfutent absolument cette théorie.—Làbas, quoique les lapins auxquels on inoculait le choléra des poules mourussent, pourtant ils ne transmettaient pas leur maiadie à leurs congénères.

Appendix IV.

Il n'y a qu'un cas dans lequel a lieu certainement la transmission du typhus d'un individu à l'autre: c'est quand les sujets morts dans leurs nids sont mangés par leurs camarades, chose qui arrive souvent. Mais ce cas s'observe aussi quand on emploie les appâts empoisonnés; — les campagnols qui mangent des individus morts empoisonnés ou attaqués de typhus meurent aussi par l'une ou par l'autre cause.

Dans tous les cas, la méthode de M. Loeffler est un nouveau et sûr moyen de combattre les campagnols, ainsi que tous les muridés. Les souris de maison, inoculées par M. Loeffler au laboratoire bactériologique d'Athènes avec le même virus, ont succombé dans quatre jours, c'est-à-dire dans le même espace de temps que les campagnols. Ce moyen, comme on a vu, ressemble beaucoup aux poisons par ses modes d'emploi et ses effets; mais, tandis qu'il est plus lent à agir que les poisons (dont les effets se font sentir dans les vingt-quatre heures), il leur est supérieur en ce qu'il n'est pas dangereux pour les gens qui l'emploient et pour les animaux utiles de toute espèce, quoique en prenant quelques précautions (mise des appâts empoisonnés dans les trous mêmes des nids, et bouchage de ces trous), on puisse éviter les accidents à ces animaux.

P. Gennadius,
Chef de la section de l'Agriculture au Ministère de l'Intérieur, à Athènes.

Appendix V.

APPENDIX V.

Statement of Rainfall at Cargen in Kirkcudbrightshire referred to in the Evidence given at Thornhill by Robert Service, of Maxwelltown, Dumfries.

	February.	March.	April.	Totals for Three Months.	Observations.
1861	4·47	5·06	0·77	10·30	
1862	1·49	3·41	3·92	8·82	
1863	2·01	1·08	3·09	6·18	
1864	2·77	3·88	1·40	8·05	Vole attack. Q. 1565.
1865	2·96	1·49	0·71	5·16	
1866	4·45	5·68 (Voles disappeared.)	3·50	13·61	
1872	6·76	3·96	1·13	11·85	
1873	1·05	3·59	0·10	4·74	
1874	2·30	2·74	5·98	11·02	
1875	1·21	1·60	1·50	4·31	Vole attack. Appendix III.
1876	6·38	4·66 (Voles disappeared.)	2·61	13·65	
1887	1·98	1·33	1·17	4·48	
1888	0·70	2·61	1·54	4·85	
1889	1·68	3·12	2·69	7·49	
1890*	1·00	2·59	1·44	5·03	
1891*	0·28	2·52	1·94	4·74	4·36 in. less than average.
1892*	1·30	1·03	0·76(May 3·09)	3·09	
Totals for six years	6·94	13·20	9·54	29·86	
Average of last six years	1·16	2·20	1·59	4·95	
Average of 35 years	3·48	3·03	2·14	8·65	

Thus showing 3·70 less rainfall in these spring months than the average of the last 35 years.

* Taking only these years the deficiency of rainfall is still more marked.

This Statement has been prepared by Mr. Dudgeon of Cargen, and, although the recording station is not in the district infested by voles, the principle will be found to apply, although the figures may differ a little.

APPENDIX VI.

1.—ON EPIDEMICS AMONGST MICE KEPT AT THE HYGIENIC INSTITUTION AT GREIFSWALD, AND ON THE BEST MEANS OF COMBATING A PLAGUE OF FIELD MICE.

By Professor F. Loeffler.

Translated from the German "Centralblatt für Bakteriologie und Parasitenkunde," Band xi. pp. 129–141 (10 *Feb.* 1892).

Diseases amongst mice kept for experimental purposes in scientific institutions are of somewhat rare occurrence, and I do not know that the appearance of an epidemic amongst them has ever previously been observed. I am, however, in a position to give an account of what has occurred amongst the white mice kept at this Hygienic Institute within the last few years. These are not merely of bacteriological interest, but, as I shall show, they are of no little practical interest also.

The stock of white mice at the Institution is kept in two quadrangular glass cases, each about 40 cm. square, which are covered with wide-meshed wire gauze. The mice are fed on oats and pieces of bread softened by being dipped in water. The bottom of the cages is covered with saw-dust, over which a little straw is scattered, so that the mice may hide in it.

In July, 1889, the attendant informed me that while cleaning a cage which contained about forty mice, he had found dead ones amongst them for some little time. I immediately made an inspection, and found three in a cage apparently diseased. They were at once isolated, and died in the course of the two following days. On dissecting the first I found the typical condition of Koch's "mouse-septicæmia" (*Mäuseseptikämie*). The culture from the organs affected confirmed the diagnosis. Dissection and culture showed that the other two mice had also died of this "mouse-septicæmia." During the next few days three more died in the same cage, all from the same cause. According to the attendant's report, at least fifteen mice died, and all probably from the same disease. It is highly probable that the infection was conveyed through the digestive system, as the first mice found dead had been partly devoured. We did not discover the cause of the appearance of the epidemic in the cage. Nothing had been done in observing the bacilli of "mouse-septicæmia." When the infected and diseased animals were removed, it ceased.

It is of special interest to find the bacillus which Koch employed to produce disease among mice by inoculation, spontaneously producing an epidemic disease among mice in captivity.

The second much more important and extensive epidemic broke out in October 1890. There were ten mice in the first cage, and forty-five in the second. All the deaths occurred in the second cage. The ten mice in the first cage were fed and treated in exactly the same way as those in the adjoining cage, but remained quite healthy.

The attendant noticed that several mice died about the 7th to the 10th of October; and by the 19th eight of the forty-five mice were found dead in the cage. I was not told that the mice were dying till the 19th October, when another large mouse was found dead. I immediately gave orders that all dead mice should be given to me for examination. On Oct. 20th two mice (1 and 2) were found dead, and a mouse which appeared diseased was isolated in the morning, and died in the afternoon (3).

On the morning of Oct. 21st three more mice were found dead (4, 5, 6), and five apparently diseased ones were isolated. In the afternoon an old one (7) and a young one (8) lay dead in the cage.

On the 23rd a young diseased mouse was isolated. It died in the afternoon (9).

On the morning of the 25th one of the isolated mice died (10). In the afternoon two more died (11 and 12).

After this all the large mice were taken out of the cage, and each isolated in a glass. The large case was emptied, cleaned, and disinfected with a solution of corrosive sublimate of the strength of one per cent. The young mice were then replaced.

Oct. 27th. Four large isolated mice died (13—16). Three small ones died in the cage (17—19).

Oct. 31st. An isolated mouse died (20).

Nov. 1st. A small one died in the cage (21).

Nov 2nd. A large isolated mouse died (22).

Nov. 7th. Another of the same died (23). With the death of this mouse the epidemic came to an end. In the course of four weeks thirty-one mice had died out of forty-five in the cage, the mortality thus amounting to 69 per cent. The first eight mice were not examined, but all the others were. All those examined had died of the same disease, and no doubt this was the case with the first eight. The epidemic must be regarded as uncommonly fatal. It is highly probable that all the mice would have died if the epidemic had not been arrested by strict isolation and disinfection.

Nearly all the mice found dead in the large cage had been more or less eaten. The brain was generally gnawed away, and in several cases the bodies were half-devoured. This fact, taken in connexion with the observations on the first epidemic, which was caused by the bacilli of "mouse-septicæmia," leads to the suspicion that the infection is caused and multiplied by receiving the cause of the disease *per os*. Further investigations confirmed this suspicion.

The appearances, on dissection, were on the whole very similar, but varied considerably in individual cases. On opening the abdominal cavity, a splenetic tumour was almost always observed. The spleen was large, brownish red, and generally solid. The liver was usually parenchymatously turbid. It generally displayed a very large amount of fatty matter, and sometimes also showed small yellow specks. Sometimes the liver was very full of blood, and sometimes dry and shining; but it frequently exhibited an entirely normal appearance.

Now and then a mouse was found in which the abdominal cavity contained fresh blood, without my being able to discover the source of the hæmorrhage. The stomach and intestines showed numerous alterations. Very frequently slight hæmorrhage occurred in the mucous membrane of the pyloric region of the stomach, as well as at the anterior portion of the duodenum, and the "Peyer's bodies" were frequently congested, and also somewhat swollen. The lower part of the small intestine was generally filled with blackish contents. The mesenteric glands were distinctly, and sometimes considerably, swollen, dark reddish grey in colour, and permeated by hæmorrhage.

The kidneys were usually pale, sometimes parenchymatously coloured. The lungs were sometimes normal, and sometimes blotched with red. Here and there brownish-red portions were visible. The brain exhibited nothing peculiar.

Bacteriological investigation gave precisely similar results in all the mice examined. On expressed preparations (*ausstrichpräparaten*) of the liver and spleen, I found short bacilli, usually very numerous, but sometimes very sparingly resembling the bacilli of pigeon-diphtheria (*Taubendiphtherie*). These varied in length and breadth, both in the same individual and in different cases. Many appeared truncated, especially when the bacilli were present in large masses, and many were strongly developed. In this respect the rods resembled those of the typhus-bacillus, which also varies in size within certain limits. When examined in hollow object-holders, they exhibited lively movements similar to those of the typhus-bacillus. This led to the suspicion that these, like the latter, might have multiple *flagella*. In fact, they behaved like the typhus-bacillus when macerated in a suitable infusion, but better still when macerated in rather strong alkali, which made the lateral *flagella* visible. In some mice bacilli could be detected in all the organs, while in others they were sought for (in blood from the cardiac region, for example) without success. But similar bacilli were obtained by culture from all the mice. Tubes of gelatine cultures were prepared from the liver, from the spleen, and from the cardiac region. The culture from the last named remained sterile in many cases, but colonies were invariably developed from the spleen, and especially from the liver. The number of these differed very considerably. Sometimes the whole surface of the gelatine was covered with an even coating of bacilli; sometimes the separate colonies were separated and developed at a considerable distance from each other, and sometimes only a few colonies appeared on the entire surface of the gelatine. On the whole, the number of colonies

corresponded to the quantity of bacilli found in the expressed preparations. In those cases where no bacilli could be discovered with the microscope a few typical colonies were only developed exceptionally by cultivation.

The mode of increase of the bacilli was as follows :—On gelatine-tubes kept in the temperature of the room hardly anything was to be seen with the naked eye after twenty-four hours. But with the lens small colourless particles were already discernible. After forty-eight hours the colonies became visible as round, greyish white or bluish-hyaline bodies, about as large as a pin's head. During the next few days the colonies enlarged, if they were wide apart they formed patches from 3–4 mm. in breadth. They then generally lost their rounded shape, and formed zigzag protuberances with rough edges. Then the gelatine began to get somewhat turbid. Slight alterations in the composition of the gelatine (as happens with each new preparation) influenced the appearance of the colonies. In one preparation the colonies were always round and rather thick, and consequently but slightly transparent, and whiter. In another the condition already described appeared more like that of typhus bacilli. The individual bacilli in this cultivation were of unequal length. Among the more numerous were short forms, with lively motions ; others long and thread-like, sluggish, or even motionless.

They were readily coloured by the aniline dyes employed, and best with the alkaline solution of methyline-blue, which I have elsewhere recommended.

In plate-cultivations (*plattenkulturen*), the deep-seated colonies appeared round, at first hyaline-grey and slightly granulated, afterwards yellowish brown and strongly granulated. The colonies nearer the surface were strongly granulated, and delicately furrowed, like colonies of the typhus-bacillus, but not so prominent.

On "agar-agar," a greyish-white and little characteristic coating was formed. On blood-serum, and especially on sweetened peptonized bouillon, mixed with blood-serum, as I have elsewhere recommended, a transparent coating appeared. Distilled water soon became turbid.

The formation of spores was not observed in any nutritive fluid, not even when heated.

They grew upon potatoes in a very characteristic manner. They formed a whitish and not very thick coating, and the adjacent substance of the potato showed a dirty greyish-blue tint. In sweetened peptonized bouillon they grew strongly. They rendered it turbid with the gas engendered, and then formed a thick cloudy layer on the surface. The previously neutral reaction of the bouillon now became rather strongly acid. The presence of alcohol in the distillation was proved by the iodine test.

The bacilli also developed well in milk. The appearance of the milk was not altered during their growth, but the reaction became rather strongly acid.

On examining sections of the organs, I found the bacilli generally arranged in masses within the capillaries. They formed masses, like those in human typhus. Now and then single specimens were seen in the capillaries ; they often lay within them like large colourless cells. The yellowish spots in the liver, which were often perceptible to the naked eye, contained no more liver-tissue, and were generally surrounded by disintegrated matter. There was always a mass of bacilli in the centre of these portions. It appeared as if the bacilli had caused the disappearance of the liver-cells, and disintegration. In other places the masses lay in the normal tissue without causing disintegration. The mesenteric glands were pervaded with enormous masses of bacilli. The appearances rather reminded me of those which I obtained after inoculating mice with the bacilli of pigeon-diphtheria (*Taubendiphtheriebaccillen*).

The bacillus belongs indubitably to the group of typhus-like bacilli of which a considerable number are already known. As it has most resemblance to human typhus-bacillus, I propose to call it the bacillus of mouse-typhus (*Bacillus typhi murium*).

As regards the mode of infection, in this epidemic, it is undoubtedly caused by infection through the digestive organs. This is abundantly proved by the alterations in the small intestine, and in the mesenteric glands. I cannot positively affirm that the infection is caused entirely by nibbling a companion who has died of the disease. In a number of mice which I examined with all care I found bacilli in the contents of the intestine. I think it not improbable that living bacilli which have been evacuated with the fæces may get mixed with the food, and be thus swallowed by other mice. Young mice especially, which as a rule took no part in gnawing at the corpses, might have become infected by foul food. The possibility of infection by inhalation had also to be considered.

The opportunity for the pulverisation of bacilli in the straw is very favourable. The diffusion of germs through the air, if it happens at all (and I have not studied this mode of infection experimentally), is certainly of very subordinate importance. In the second mouse-cage, which stood close to that which contained the diseased mice, there was no infection.

The duration of the epidemic was somewhat lengthy. Eight mice were isolated on the 25th of October, and the last of these did not die until the 7th of November. If we assume that this mouse was only infected on the 25th of October, just before its isolation, thirteen days elapsed between the date of its infection and its death. The period between infection and death was experimentally established as from one to two weeks. I could make these experiments on white mice until I was certain that the epidemic had really disappeared. I therefore waited for some weeks before I commenced with them.

In the meantime I resolved to make some experiments on other animals, to see whether they were susceptible to the bacillus. My chief interest centered in the field vole (*Arvicola arvalis*), which was obtainable in great abundance in the neighbourhood of Greifswald in November 1890. Through the kindness of Dr. Ollmann and Dr. Hesse, I was easily enabled to procure plenty of these little animals for experiment. As is well known, Koch has proved that the field vole is proof against the minute bacillus of mouse-septicæmia; but, on the other hand, I have established the fact that it is extremely susceptible to the bacillus of glanders ; whereas the tame white mouse is proof against it. It therefore appeared to me doubtful whether the field voles would be susceptible to the bacillus causing the epidemic amongst white mice. On Nov. 10th I inoculated two field voles under the skin of the back with the gelatine culture obtained from the liver of the mouse which had died on Nov. 2nd. One field vole was found dead on Nov. 12th The spleen was large, the liver moist and shining, and the lungs spotted. On making an expressed preparation of the liver, the typical bacilli were found in greater abundance. In the gelatine-tubes a thick coating of bacilli was formed. On the same day, Nov. 12th, and immediately after the examination, this field vole was thrown into a cage amongst three healthy field voles, which at once began to gnaw the body.

On Nov. 14th, four days after the inoculation, the second field vole died. At the point of inoculation, I found a yellowish fibrinous gathering containing enormous masses of bacilli, partly truncated, and partly enclosed by large colourless cells. Otherwise the result of the examination was as in field vole No. 1. A preparation of the liver exhibited very numerous bacilli, the presence of which was also proved by cultivation.

The three field voles which had fed on vole No. 1 died on the 17th, 18th, and 20th November respectively. They all exhibited the same conditions, and in particular the mesenteric glands were greatly enlarged, and of a brownish-red colour.

The three field voles which died on the 20th November were again thrown into a cage with three others. These three all died on the 28th and 30th November, and on the 2nd December, after eight, ten and twelve days respectively. They appeared lively till about two days before their death. After this they appeared less lively, and at last sat huddled up, with erect hair. They were hardly dead when their comrades made them a source of death to themselves by devouring them. It is well known that field voles devour the dead or weak and sickly individuals of their own species. After this first experiment I could no longer doubt that the *Arvicola* was at least as susceptible to the bacillus as the white *Mus*.

I made so many experiments in infecting field voles that I cannot repeat them all in detail. I will only say that the infection *per os* invariably succeeded, whether I threw them potato-cultivations, bread moistened with bouillon culture, or only poured a few drops of the latter into the cage; the animals invariably died from eight to twelve days afterwards, and in every carcass the typical bacillus was present.

This proof of the great susceptibility of field voles to this bacillus, and their easy destruction by this means, seems to me to be of great practical importance to agriculture. In many districts these field voles are a veritable scourge. They cause enormous losses by their fecundity and voracity. Brehm gives an appalling picture of their habits and their importance to Agriculture in his *Thierleben* (vol. ii. p. 388). He says :—

"Their food consists of every sort of vegetable substance. When they can obtain seeds they feed only on these, but at other times they content themselves with fresh grass and herbs, roots and leaves, clover, fruits, and berries. Beechmast and nuts, corn, turnips, and potatoes are badly attacked by them. When the corn begins to ripen they assemble in hordes in the fields, bite the stalks through at the base till they fall over, then gnaw them through,

above, and drag the ears into their burrows. During the harvest they follow the steps of the reapers from one crop to another, devour the corn that has dropped among the stubble, gather the ears up which have fallen in binding up the sheaves, and at last find their way to the stackyard, where they find provision for the winter. In the woods they collect the fallen haws, juniper-berries, beechmast, acorns, and nuts in their burrows. During the hardest weather they fall into uninterrupted hibernation, but when milder weather returns they rouse up, and feed on their stores. They are incredibly voracious, and require much to satisfy them; but they cannot do without water.

"Field voles are very gregarious, and live socially together, at least in pairs, but more commonly in great hordes, and therefore they link one burrow to another. They multiply with extreme rapidity. Even in April we find from four to eight young in their warm nests, which lie from 40 to 60 cm. below the surface of the ground, and are softly lined with fine fragments of grass or hay, and moss; and in the course of the summer the female produces young from four to six times more. It is highly probable that the young of the first brood are themselves ready to breed in autumn, and the amazing increase in their numbers is thus easily explained.

"'Under favourable circumstances,' says Blasius, 'the field vole multiplies in an incredible manner. Many instances are known in which a large part of the harvest has been destroyed over large tracts of country by their inordinate increase, and more than a thousand acres of young birch trees have been destroyed by their gnawing the bark.' Those who have never experienced such a vole-year can hardly form a conception of the almost incredible swarms of mice in the fields and plantations. They often appear in a particular neighbourhood without their gradual increase having been observed, as if they had suddenly come upon the earth by magic. It is possible that they sometimes migrate suddenly from place to place. But their rapid multiplication is generally foreshadowed for weeks beforehand by the increase of the Buzzards (*mäusebussarde*). During the twenties, the Lower Rhine was repeatedly visited by such a plague. The fields were so undermined in places that you could scarcely set foot on the ground without touching a mousehole, and innumerable paths were deeply trodden between these openings. On fine days it swarmed with voles, which ran about openly and fearlessly. If they were approached, from six to ten rushed to the same hole to creep in, and unwillingly impeded each others' progress by crowding together. It was not difficult in the crush to kill half-a-dozen with one blow from a stick. All seemed to be strong and healthy, but mostly rather small, for the greater part were probably young ones. Three weeks after after I revisited the place. The number of voles had actually increased, but the animals were apparently in a sickly state. Many had mangy places or sores, over the whole body, and even in those which appeared sound, the skin was so loose and delicate that it could not be roughly handled without destroying it. When I visited the place for the third time, four weeks later, every trace of them had disappeared. But the empty burrows and passages awakened a much more dismal feeling than when they swarmed with life. People said that the whole race had suddenly disappeared from the earth as if by magic. Many may have perished from a devastating pestilence, and many have been devoured by their fellows, as happens in captivity; but people also spoke of the innumerable hosts that had swum across the Rhine at several places in open day. No extraordinary increase was noticed anywhere over a wide area; but they seem to have disappeared everywhere at the same time, without reappearing elsewhere. Nature must have put a stop to their inordinate multiplication at the same period. It was fine warm autumn weather, apparently favourable to them to the last moment."

In order to give some idea of the vast hordes of voles which sometimes appear in certain districts, I may state that in 1822, in the single district of Zabern, 1,570,000 mice were caught in fourteen days; in the district of Nessa, 590,427; and in that of Putzbach, 271,941.

"In the autumn of 1856," says Lenz, "there were so many mice in one district of about four leagues in circumference between Erfurt and Gotha, about 12,000 acres of land had to be reploughed. The sowing of each acre at harvest wages 6s., and the ploughing up was estimated at 1s. 6d.: so that the loss amounted to from 2,000*l.* to 4,000*l.*, and probably much more. On a single large estate near Breslau 200,000 were caught in seven weeks, and delivered to the Breslau manure factory, which then paid a pfennig (half-a-farthing) per dozen for them. Some of the mouse-catchers were able to supply the factory with 1,400 or 1,500 per day. In the summer of 1861, 409,523 voles and 4,707 hamsters were caught and counted in the district of Alsheim in Rhenish Hesse. The local authorities paid 2,523 gulden (about 164*l.*) for them!

Appendix VI

"In the years 1872 and 1873 it was just the same, and local complaints arose in all parts of the country about the vole-plague. It might be compared to one of the plagues of Egypt. Even in the day, on the sandy plains of the Mark of Brandenburg, thousand of voles were counted in particular fields, and in the rich corn-lands of Lower Saxony, Thuringia, and Hesse, they abounded to a fearful extent. Half the harvest was destroyed, hundreds of thousands of acres were left untilled, and thousands of pounds were spent on their destruction. Agricultural Societies and Governments were implored to seek ways and means of staying the plague.

"Sometimes the voles attack plantations. In 1813 and 1814 they caused so much destruction in England among freshly-planted trees of one or two years' standing as to cause serious alarm.* Throughout wide districts the little animals not only devoured the bark of all the saplings, but also peeled the roots of many oaks and chestnuts that were already fairly grown, and thus destroyed them. The Government was forced to take the most energetic measures to repair this enormous damage.

"Unfortunately, man is powerless against these voles. All the means of destruction which have yet been devised seem insufficient to check the inordinate multiplication of these greedy hosts; only Providence and the useful predacious animals, to which man is so hostile, can help him. 'Borers' have been used with good results, with which, where the soil permits it, holes are made in the ground, 12—18 cm. in circumference, and 60 cm. deep. When the voles fall in, instead of burrowing their way out, they devour each other. When the fields were being ploughed, children followed with sticks, and destroyed as many as possible. Smoke has been driven into the burrows, poisoned grain thrown in, whole fields saturated with a decoction of strychnine or spurge, *Euphorbia cyprissias* (*mit einem Absud von Brecknuss oder Wolfsmilch*). In short, every means has been adopted to get rid of this terrible pest; but in general all these methods have proved nearly useless, and some of them, especially poisoning, highly dangerous. The most efficacious poison not only destroys all the mice in a field, but likewise their worst enemies, and, consequently our friends—foxes, martens, stoats, weasels, buzzards, owls, and rooks besides partridges, hares, and domestic animals, from pigeons to horses and oxen—a sufficient reason for abstaining altogether from the use of poison. It is painful to all naturalists and lovers of animals to see the enemies of the mice, as in 1872, poisoned and destroyed, instead of cared for and protected. Short-sighted people—farmers who cared more for hare-hunting than for making the best use of the land—were delighted when they found, besides dead mice, hundreds of poisoned rooks, buzzards, owls, foxes, weasels, and stoats; but they did not consider what mischief they had entailed upon themselves in their senseless efforts to destroy the voles. It was not the destruction of the useful but despised mouse-killers that concerned them, but when hares, partridges, and domestic animals were also poisoned, they were at last induced to give up the use of poison. Till then, the warnings of far-seeing advisers were disregarded. The warnings which they had given, both verbally and in print, that laying poison in the fields might perhaps benefit the infected land, but not agriculturists, were not appreciated till too late. Besides poison, smoking out the voles was tried on suitable ground with satisfactory result. All the holes were stopped up, and poisonous coal and sulphur-smoke (bisulphide of carbon) was allowed to pour into the burrows which the voles reopened: but this efficacious mode of destroying them could not be employed everywhere, and was very expensive. People knew not what to do, because they had neglected to destroy the mice at the proper time."

Thus far Brehm. I believe it would be possible to destroy the voles effectually by means of the bacillus which I have discovered, even if they did not devour their dead and dying comrades, as they do in captivity. It would be easy to produce any quantity of cultivated fluid, to drop it on bread or corn, and to scatter this infected food over the fields infested.

But, before attempting this experiment on a large scale, it would be necessary to make extensive trials to discover whether other animals besides voles could be infected with the bacilli *per os*, or not. I have made a series of experiments in this direction, and have obtained the following results. The natural destroyers of the voles, namely, cats, are proof against the bacillus. I have fed five cats with many dead or dying house and field-mice, and not one of

* This was in the Forest of Dean and in the New Forest. *See* Appendix II.

Appendix VI.

them contracted the disease. I have also fed a number of rats on the bacillus without their becoming affected.

Among the field-mice which were brought me I found several specimens of the "Brandmaus" (*Mus agrarius*), which is distinguished by a black stripe along the middle line of the back, over a reddish-yellow fur; this species, too, did not become diseased. Nor did small singing birds of different kinds, whose food was damped with the solution, sicken. No result followed in the case of fowls, pigeons, guinea-pigs, and rabbits, though they were fed with infected food for a long time.

In the case of two four-weeks' old pigs, which were fed with large quantities of cultivated bacilli, one remained quite healthy after several months' observation, and the other died eight days after the commencement of the experiment, of abdominal catarrh, which was probably not produced by the bacilli. No trace of the bacilli could be obtained from the organs of the animal by means of cultivation.

Amongst all the animals on which experiments were tried by infection through the digestive system, only the house-mouse and the field-vole have hitherto shown themselves susceptible. Consequently, the danger of other animals becoming affected by taking food infected by the bacillus is very slight. But in the meantime, before commencing an experiment upon a large scale, it would be necessary to make more extensive trials on animals of the most different kinds, especially on all the species which are of any importance to agriculture.

But I must premise that many of the animals which are not susceptible to the infection through their food, sicken and die when inoculated with the bacilli hypodermically. I succeeded with subcutaneous inoculation in the case of several rats, small birds, pigeons, and guinea-pigs. In the case of the birds, an extensive yellowish lardaceous infiltration was locally developed at the point of inoculation in the thoracic muscles, which led to necrotic separation of the diseased part. In this substance I found enormous masses of bacilli. But I could not obtain any from the liver of the dead animals by means of cultivation. They died in from three to eleven days after inoculation. Rabbits showed themselves to be only slightly susceptible. At the point of inoculation only slightly sympathetic inflammation appeared, or local discharges, which lasted for weeks, but finally healed up.

From the forgoing observations, I hope that the new *bacillus typhi murium* will give us a weapon which may be effectually used against the field voles which cause so much damage to agriculture. The best time for contending with them seems to me to be spring, when the frosts are over, but before their food has become very abundant.

It is a very favourable circumstance that the bacillus retains its vitality for a long time both in the wet and in the dry state. Gelatine-cultures retain their vitality and infective properties after being kept for six months.

The question then arises, What is the origin of the epidemic? This question I cannot answer. The bacilli bear a certain resemblance to those which I have found in pigeon-diphtheria; also to those of the pseudo-tuberculosis of rabbits and guinea-pigs, which I discovered in 1883, when employed at the Hygienic Institute, and which I have carefully studied and experimented on; to the bacilli of the American and Danish swine-plague, to the bacillus of ferret-disease, the bacillus of the spontaneous rabbit-septicæmia of Eberth, the *bacterium coli commune*, and other forms belonging to the group of typhus-bacilli. It might perhaps be thought that the bacillus of mouse-typhus was related to one of the species of bacteria which I have mentioned, and might be a variety of one or other of them. But this cannot be the case. No work has been done in the Hygienic Institute for the last few years with any of those bacteria, except with the *bacterium coli commune*, and the bacilli of the spontaneous rabbit-septicæmia, which Prof. Eberth was kind enough to send me. But these are altogether different from the bacillus of mouse-typhus.

The next thing thought of was the possibility of infection through the food. But, though all the mice were fed on the same oats and bread, those in one cage were decimated by the epidemic, while not a single mouse sickened in the other. For the present, therefore the origin of the bacillus remains in obscurity.

In the course of 1891 the same bacilli have twice caused a fatal epidemic among the mice in the Institute. In May it killed nine mice out of seventeen, and in September eighteen mice out of thirty-eight. On each occasion the epidemic could only be arrested by long-continued isolation of all the mice.

II.—THE PLAGUE OF FIELD VOLES IN THESSALY, AND ITS SUCCESSFUL COUNTERACTION BY THE *BACILLUS TYPHI MURIUM*.

By Professor F. Loeffler.

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In the middle of March of the present year it was reported in all the papers that telegrams had been received from Larissa to the effect that the plains of Thessaly were infested with myriads of field-voles, which threatened to destroy the whole harvest. This news was especially interesting to me, because I had published an article in the 'Centralblatt für Bakteriologie und Parasitenkunde' (Band xii. pp. 129-141, 10 Feb. 1892), in which I had announced a new bacteriological method of combating the plague of field-voles. If the news in the papers was true, it offered me a rare and favourable opportunity to test the practical efficacy of the *bacillus typhi murium* which I had discovered. As I stated in my former paper, the bacillus, when absorbed through the digestive system, proved only fatal to house-mice and field-mice, but appeared to be perfectly innocuous to many other species of animals, such as cats, rabbits, guinea-pigs, pigs, small singing birds, pigeons, and fowls. I also stated that it was important for the practical utility of the bacillus to ascertain by numerous experiments that all farm-animals enjoyed similar immunity. I therefore made experiments in feeding sheep, which Councillor Becker, of Eldena, placed at my disposal in the most obliging manner. The results fully answered my expectations, for though the sheep is particularly susceptible to disease, those on which I experimented took enormous doses of the bacillus without showing the least sympton of illness, whilst all the voles which were treated with the same bacillus died, without exception, of "mouse-typhus" after the usual period of from eight to fourteen days. The results of the experiments rendered it in the highest degree probable that the larger farm-animals, such as horses and oxen, would likewise be proof against infection. In any case it seemed to me that the practical application of the bacillus might be tested without hesitation in the Thessalian fields which were threatened with such danger, where almost the only animal of importance in the neighbourhood, the sheep, had been proved to be unsusceptible to it.

On March 9th, the Greek Government, influenced by the report of his Excellency the Greek Ambassador at Berlin, M. Rangabé, who had studied the pamphlet I sent him, and perhaps partly also by telegraphic information, respecting the bacillus which I had descovered, from the eminent French bacteriologist, Prof. Pasteur, requested me to supply tubes of the virus for experiment in Thessaly. I felt no further hesitation about carrying out the experiment on a large scale.

It was first necessary for me to explain how the trial was to be conducted, that there might be some certainty of attaining the desired result. I had learned from previous experiment and observation that within the narrow limits of a cage the disease was communicated from one infected animal to another in the course of a few weeks so that at length all were attacked. The infection was communicated by a healthy animal taking the bacillus in food fouled by the fæces of those already ailing which were charged with bacilli; and afterwards by their devouring the individuals which had died of the disease, and which swarmed with bacilli. The first mode of infection of course was possible in a state of freedom. But it was doubtful whether field voles in a state of nature would devour the bodies of their dead comrades, and feed on the brain and entrails, as they invariably do in captivity. Many experienced agriculturists, however, thought that they do feed on the dead corpses in the same way in a state of freedom, though others doubted whether this supposition was correct. Again, it seemed uncertain to me whether the voles would run from one burrow to another, and thus spread the disease. It was therefore not enough to infect a few mice, set them at liberty, and wait to see whether the disease would be propagated in the course of some

weeks, as within the narrow limits of a cage; but it was needful also to devise some mode of infection in which the propagation of the disease by cannibalism should not be the main object. Doubtless the result would be obtained with much greater certainty if the bacillus were scattered with food in the most wholesale manner over all the lands infested by the voles in order to accomplish the destruction of the majority by primary infection. As I was doubtful (a doubt fully justified by subsequent experiments) whether the exhaustive undertaking which I contemplated in Thessaly could be carried out without my personal supervision, I promised his Excellency the Greek Ambassador, M. Rangabé, that I would consent to furnish the Greek Government with some preparations of the bacillus, though I was unwilling to do so because I was doubtful whether this means of destroying voles could be carried out in the way which I intended, and because I was afraid that some mishap might occur which might have nothing to do with the method itself, but which might throw discredit on this entirely new bacteriological experiment. But I declared that I was quite ready to carry out my own experiments in Thessaly myself if the Greek Government would defray the travelling and hotel expenses for myself and an assistant. On April 1st I received a telegram informing me that the Greek Government invited me to come to Greece on the terms which I had offered. But before definitely accepting the invitation, I wished first to ascertain a very important point, which was taken for granted, but which my experiments on other species of mice showed to be by no means necessarily the case, whether the field vole which had invaded Thessaly was really the same species, *Arvicola arvalis*, which occurs with us, and on which I had tested the action of the bacillus. The brown rat which belongs to the genus *Mus* (*M. decumanus*) as well as a species distinguished by a black longitudinal streak along the back ("Brandmaus," *Mus agrarius*), had shown themselves proof against the action of the bacillus, when fed with it. I therefore telegraphed as follows to his Excellency M. Rangabé :—

"Before I start with my assistant, I should like to be certain that the field vole in question is *Arvicola arvalis*. The species is very important, as I have only established the action of the bacillus in *Arvicola arvalis*. Please inquire in Athens, and let me know.—Loeffler."

Next day I received the answer :—

"It is *Arvicola arvalis*, called 'campagnol' in French.—Rangabé."

After this important preliminary was settled, I no longer hesitated to try the bacteriological conclusions with the Thessalian field vole. My preparations were quickly made. A large quantity of the bacillus on obliquely stiffened "agar agar" in glass tubes was prepared, and carefully packed in a case. Besides this, my assistant, Dr. Abel, and I both took two tubes with cultivations of the bacillus in our personal charge, so that, in case the large box should be lost, we should have some preparations as a foundation for other experiments. On Tuesday, April 5th, we started from Berlin, and after four days' constant travelling *viâ* the Brenner, Brindisi, Corfu and Patras, we arrived on April 9th in Athens. Next morning I announced our arrival to his Excellency M. Konstantopulos, the Prime Minister. At ten o'clock arrived Dr. Pampoukis, the head of the bacteriological laboratory in Athens, who was instructed by the Government to aid us in carrying out the experiments. The bacteriological laboratory in Athens' which was founded by the former Prime Minister, M. Trikoupis, at the instance of M. Chatzimichalis, the Professor of Pathology, forms a branch of the Pathological Institute conducted by Prof. Chassiotis. At the Institution were a dozen Thessalian field voles, which the Government had ordered to be sent to Athens at my request. We went thither with Dr. Pampoukis to see them, and to satisfy ourselves about the important question of the species.

I perceived at the first glance that the Thessalian field vole was undoubtedly different from our *Arvicola arvalis*. It was considerably larger, paler in colour, with large shining eyes, and a very short tail. It had a much more vigorous and rat-like appearance than our field vole.* It was enough to damp my expectations considerably to discover that I had to deal with an obviously different, though allied, species. Before we could think of undertaking any further measures and preparations for the practical application of my method in Thessaly, it was necessary to ascertain whether this species was susceptible to infection by the bacillus, especially *per os*. Three of these field voles were immediately subjected to subcutaneous inoculation with some of the cultivated bacillus which I had brought with me, and three others were fed with pieces of bread dipped into some virus diluted with water. When I afterwards visited his Excellency the Prime Minister, I informed him of my observations respecting the species, and declared that before anything further could be attempted, we must wait for the result of the experiments which had just been commenced.

The Director of the Agricultural Department of the Ministry, M. Gennadius, then added that the scientific determination of the species was rather difficult, and that the Thessalian field vole exhibited several of the characters of *Arvicola arvalis*, but that it might possibly be *Arvicola Savii*.

The question of the susceptibility of the Thessalian species asserted itself, to my great joy, much more rapidly and favourably than I had dared to hope. One of those inoculated died in two days, the second in three, and the third in three and a half days. All the bodies exhibited quantities of bacilli in the internal organs, which could also be obtained from them by the ordinary methods of cultivation. The first animal fed with infected matter died in five and a half days, and a second in seven days; both exhibited the characteristic pathological and anatomical changes of "mouse-typhus," viz., enlarged spleen, parenchymatous liver and kidneys, and inflamed and swollen mesenteric glands.

From these results it appeared that the Thessalian vole was even still more susceptible to "mouse-typhus" than our *Arvicola arvalis*, which generally did not die until ten or twelve days after absorbing the bacillus with its food. The body of one of the inoculated voles which was left in the cage was found next morning half-devoured, the brain and liver being eaten away, although the three animals in the cage were plentifully supplied with food.

We at once commenced our preparations. In accordance with the experiments which I had carried out at Griefswald, the bacilli could be propagated in various inexpensive cultivating fluids. Infusions of oat and barley straw had proved very suitable for this cultivation. By adding one per cent. of peptone and one-half per cent. of grape-sugar to this infusion, cultivating fluids were obtained, in which milliards of bacilli could be developed at incubation temperature in one night, after the addition of a few germs.

The next thing to be done was to sterilise these cultivating fluids in large quantities. The bacteriological laboratory was excellently fitted up, but did not of course possess apparatus for the preparation of hundreds of litres of cultivating fluid. I had hoped to find a large steam disinfecting apparatus in Athens in which the sterilisation of large quantities of fluids might have been undertaken. But there was no large apparatus of the kind in the city. The only apparatus suitable for my purpose was in the University Hospital. It was a steam disinfecting apparatus of half a metre broad, and about one metre long, and was heated with coal. This apparatus was at once placed at my disposal in the most obliging manner by the authorities. The straw was boiled in large boilers in the kitchen of the hospital. The decoction was poured through a sieve and placed in glass flasks covered with wicker basketwork, to be sterilised in the flasks, the mouths of which were stopped with wadding. But although the flasks were put into a cold oven, and gradually heated, they could not sustain the sterilisation, owing to the very unequal strength of the glass. Two flasks out of three burst. Nor would large glass flasks containing six litres bear the sterilisation. We were consequently obliged to abandon the use of glass. The only material from which large vessels could be quickly and cheaply made and which would bear the heating, was tin. But before having large vessels made of this material, it was requisite to ascertain whether the germs would multiply in tin. The bacilli yield an acid in the course of development, and perhaps their growth might be unfavourably affected by the substances derived from the vessel which might be dissolved. A preliminary experiment, however, in a small tin vessel showed that the development of the bacillus proceeded without interruption. After this, four large milk-can-like vessels, each containing sixty litres, were prepared. These were filled with the straw-infusion, to which peptone and grape-sugar had been added, neutralised with sodium carbonate (*mit kohlen-saurem Natron*) and sterilised by being boiled thrice for two hours in a current of steam. After the vessels had cooled down to 40°, they were charged with a pure culture of bacillus, and submitted to a temperature of over 30°. After two days, the bacilli were developed in the vessels in great abundance. At the same time, with the friendly aid of M. Pampoukis and his assistant, M. Metaxas, 412 tubes were filled with pure culture on obliquely-stiffened "agar." We were able to impregnate at least a litre of water with each agar-tube,

* Later on I propose to publish an exact description of the species, when I receive the specimens which I have had preserved in alcohol.

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in which the pieces of bread designed to infect the voles were to be dipped. We had thus sufficent material to infect a large district in case the bacillus-laden infusion should have been spoiled in transport.

On April 16th we set sail in company with M. Pampoukis for Volo, arriving there early on the 18th, and took the train to Larissa, the capital of Thessaly, in the neighbourhood of which we were to commence our proceedings. On the road we encountered in the neighbourhood of Velestino great flocks of buzzards, kites, sparrowhawks, and storks flying around the fields and fallow lands. It has been observed in other countries, too, that an increase of field voles is usually accompanied by a great increase of the various animals which prey upon them. The railway traverses a wide plain, bordered on the east by the Kissavos (the ancient Ossa), and on the north by the snow-covered Olympus. The plain is bounded on the west by a low chain of hills, and is the most important of the plains infested by the voles near Larissa. The whole of Thessaly is really one vast plain bordered by mountains and divided by the range of hills just mentioned into the plain of Larissa and the plain of Trikala. It is traversed from west to east by the river Peneios, which descends from Pindos into the plain near Kalabaka, south of the wonderful rock-monasteries of Meteora, and leaves the plain north-east of Larissa, between Olympus and Kissavos, forming a beautiful vale of Tempe. The soil is extremely fertile, heavy, and in many places reddish loam, which is often inundated by the Peneois in winter over a large extent of country. These inundations are connected with the frequent occurrence of intermittent fever in the low-lying districts. The whole plain is treeless, except near Velestino, the first station on the line from Volo to Larissa, which may be due to a large number of springs which rise there. This vast fertile plain is for the most part the property of large landholders. Some of these gentlemen own as much as a hundred thousand acres of land. The population is scanty. The villages are mostly small and unimportant. The houses are built close together in such a manner as to encompass the much larger mansion of the owner like a wall. Every peasant has a certain portion of the area allotted to him for cultivation, and receives a share of the harvest in return for his labour. The comparatively small number of inhabitants is of course insufficient to cultivate these extensive flats. Very large districts, perhaps more than two-thirds of the country, lie fallow. The fallow lands are used to pasture large flocks of sheep, goats, and herds of oxen.

About every three years the same tracts of land come into cultivation. There is no artificial manuring of the soil. In these extensive fallow fields the voles can multiply undisturbed. Last year the harvest was a good one, for the first time since Thessaley again became Greek territory. The field voles, which have always been plentiful in Thessaly (the ancient Greeks had their Apollo Smintheus, or Myoktonos, the Mouse-destroying God), multiplied on account of the good harvest. The following winter (1891-92) was very mild, and did them no harm, and therefore at the end of February, when a warm spring set in, they appeared in larger numbers than for twenty-five years previously. The station-master at Velestino, M. Amira, was the first to call public attenton to the appearance of immense numbers of voles at the end of February. The notion of their sudden invasion of the Thessalian plain is out of the question.

As soon as public attention was directed to their appearance, it was confirmed by reports received from very different and widely-separated localities, in the plain of Larissa. These simultaneous reports led to the notion that there must have been an invasion from without, but this was certainly not the case. At the beginning of March the voles were only beginning to troop from the slopes of the hills and the fallow-lands of the cultivated fields. It was frequently observed that they followed regular paths during their inroads. Thus they advanced along the railway embankment; their progress seemed to be rather slow. Perhaps they do not advance further till the inhabitants of one of their strongholds or so-called castle (*Burg*) has become too numerous. The "runs" which they excavate are at a depth of about twenty to forty centimetres below the surface of the ground. The extent of these runs varies, and we found them extending in length from thirty to forty metres and more. These "runs" are connected with the surface by vertical holes of about five centimetres in diameter. In many places four, five, and more holes led to the same "run." In such cases there is generally not far off an enlargement for the nest, lined with finely-gnawed vegetable material, where the young are produced and reared. In front of newly-opened holes, the earth, which has been thrown far out, forms smooth hillocks. There were many well-defined and well-trodden paths on the ground, by which the voles pass from one hole to another. They are never seen out of their holes by day, not even in places where the ground is riddled with holes like a sieve. They do not come out in search of food till evening; even then not many are to be seen, but the peculiar squeaking noise they make is heard everywhere. Next day all sorts of freshly-severed fragments of plants are found in the holes. Stalks of corn they manipulate by standing on their hind legs, and gnawing through the stalks; when this is bitten off they drag it into their holes to devour it there, and sometimes make it smaller. They are extremely prolific. Beginning in March, the female produces from six to twelve young ones every month. A reliable observer informed me that he had counted twenty-one fœtuses in the uterus of a pregnant female. The danger of the fields subsequently increases every month. The number of voles noticed this spring was apparently as large as in 1866. At that time also they were first noticed in the fallow-fields; but, as the present mischief done to the fallow-fields was but slight, the voles attracted no particular attention, and no measures were taken for their destruction. But when the vertical rays of the sun dried up the fallow-fields at the end of May 1891, as happens every year, the mice invaded the cultivated fields, in which alone they could find food, and caused such terrible ravages in a short time that last year scarcely any harvest was gathered. How suddenly and with what amazing rapidity the voles did their work of destruction is recorded in the reports of several commissioners. One evening a field was visited, which was to be mowed the following day; but when the labourers came to the place next morning they found nothing left to cut. The voles had destroyed the entire crop in a single night. A miller in the neighbourhood of Velestino reported that he went to his field early one morning, cut a measure of corn, loaded it on his ass, and brought it to his mill. When he returned with a second load to his mill, he found scarcely a vestige of the first load remaining. Thinking the corn had been stolen, he kept watch, intending to catch the supposed thief in case he returned. But suddenly, to his great astonishment, hosts of field voles appeared, which immediately set to work to carry off the second load.

Recollecting the experiences of 1866, the principal Thessalian landowners immediately formed a committee to take measures against the voles as soon as their appearance in large numbers was reported. The president and most active member was M. Anastassiades, the manager of the large estates of M. Stafanovic. It was this M. Stafanovic who telegraphed from his residence at Pera, Constantinople, to Prof. Pasteur in Paris, inquiring whether he happened to possess a microbe which could be used for the destruction of the field voles. Prof. Pasteur telegraphed back that he should apply to me, for I had discovered a microbe which would destroy them. This was forwarded to the Government at Athens, and I have no doubt that the recommendation of the distinguished French bacteriologist had some influence in deciding the Greek Government to invite me to come to Greece with an assistant.

The great danger which threatened the Thessalian harvest was at once appreciated to its full extent by the Greek Government. This year the harvest promised to be an uncommonly good one. The amount at stake was estimated at from 40,000,000 to 50,000,000 francs. The Government immediately appointed a number of specialists to deal with the voles. These were M. Kyriakos, Subdirector of the Agricultural School at Athens; M. Ambelikopulos, Professor at the Normal School at Larissa, and M. Muratoglos, Professor at the Normal School at Almiro. These gentlemen, accompanied by a number of pupils, visited the localities which were most severely threatened in the neighbourhood of Velestino and Larissa, and began to deal with the voles in the middle of May. The measures taken by these gentlemen previous to our arrival consisted in flooding the infested arable land with water, in scattering poisonous food, in sinking large tin vessels in the ground, and in pouring bisulphide of carbon (*Schwefelkohlenstoff*) into the "runs." But the flooding of the "runs" could only be carried out in a few places, partly for want of water, and partly because the local conditions were unsuitable. However, what the committee were able to do was attended with good results. They reported that the bisulphide of carbon had succeeded well. In using it, the first step taken was to close up all the openings to a colony. Next day all the newly-opened holes but one were closed. The nozzle of an injection-tube was inserted into this one open hole, and a measured quantity of bisulphide of carbon, of about 10 cm., was forced into the run by a special apparatus. It was asserted that all the voles inside were killed in a few seconds by the vapour diffusing itself

through the "runs." The Committee informed us that they had found a great many dead mice on digging up a burrow that had been thus treated. But the use of bisulphide of carbon was also only possible in certain suitable localities, that is, only where the holes in the ground were visible; for the fallow-fields were covered everywhere with great thistles almost as tall as a man, and the voles prefer to make their holes under cover of these. Again, if all the holes of a colony are not closed before the injection of the bisulphide of carbon, the vapour, and probably the animals too, will escape through the openings which have been left. At the time of our arrival the first supply of bisulphide of carbon furnished by the Government had been exhausted, and it was very difficult to obtain the large supplies which were ordered from France *viâ* Marseilles, for no vessel would carry on board a large quantity of this dangerously-inflammable substance. Moreover, the use of bisulphide of carbon became unadvisable about the end of April, because at this time of year the heavy soil had already become parched and cracked by the sun, and the vapour escaped through the fissures, without doing any execution in the "runs." As the heat increased, too, there was much loss of material. Bisulphide of carbon boils at 46·5° C. In the open fields, and exposed to the sun, the vessels containing the chemicals were easily heated above the boiling point. The inconvenience to the workmen, and the danger of fire, increased in proportion to the temperature. The scattering of poison frequently resulted in the poisoning of sheep, so that the country people were full of distrust of this method. The nett result of the measures already adopted was to be estimated at next to nothing in view of the swarms of voles existing, and the extent of territory infested.

My arrival was awaited with mingled feelings. Many, especially the owners of large estates, hoped that a thorough success might be attained through the bacillus which I had discovered. Others, and particularly the specialists commissioned by the Government, did not entertain much hope of the success of the bacteriological method, because, however satisfactory might be the results obtained in the laboratory, the experiment had not yet been tried in the open air. An unfavourable opinion had been formed of my undertaking owing to the failure of the bacteriological method in contending with the Australian rabbit-plague.

No time was lost in carrying out the new method. Mice abounded everywhere in the Plain of Larissa. By the advice of Dr. Pampoukis, the land selected for the initiatory experiments belonged to intelligent Greek owners of large estates, because we could rely upon them to carry out my plans strictly. The country people were mostly indifferent about the vole-plague. The Turkish inhabitants of the country regarded it as a visitation of God, which must be submitted to. In general they were disinclined to try any remedial measures. The notions of the Turks were well illustrated by their sending messengers to Mecca to fetch holy water, with which to sprinkle the fields, and thus, as they supposed, exorcise the mice. The peasants were mostly very indolent, and required some pressure to make them work. The Prefect of Larissa, M. Kleomenes, gave us the greatest assistance in every way, and put soldiers at our disposal, who were sent to the villages and compelled the peasants to take the needful measures. The requisition of a military escort for our personal safety, which seemed somewhat threatened by the reports published in the German papers of the appearance of mounted bands of brigands in Thessaly, proved quite unnecessary. The news in the German papers was either incorrect or greatly exaggerated, as was also the case with similar news in many Greek papers. It was most likely designed to throw difficulties in the way of the Government before the impending election. The only item of truth in the whole affair was greatly worked up by the Opposition journals, and what gave apparent countenance to the reports was that shortly before our arrival a number of prisoners had escaped from the prison at Larissa. In order to sustain their lives these people had committed some depredations in the neighbourhood of Larissa, and consequently caused a certain amount of uneasiness among the inhabitants. At last they were forced to take to flight together. Some surrendered, others were soon recaptured by the soldiers sent in pursuit of them; others again fled across the Macedonian frontier to the mountains. During our excursions to the different districts infested by the voles, I never felt any insecurity; we had always an under officer in the carriage with us, and we were always accompanied by two mounted and armed retainers of the owner of the estate we were visiting. But these people attended not so much to protect us, as to be ready to carry news quickly to places at a distance.

My plan for the practical employment of the bacillus was to dip bits of dry bread (white bread, if possible), about as large as a finger-joint, into the fluid charged with bacilli, and to put a bit of this bread into each mouse-hole. If the animals ate this bread they would certainly die, as in the case of the laboratory experiments. The disease would be communicated to those which had not eaten the infected bread partly by the bacilli in the excreta of those affected but still living, and partly by their devouring the bodies of those which died of "mouse-typhus." The mode of carrying out these measures was very simple. Making Larissa our head-quarters, we made daily excursions to places in the neighbourhood, taking with us the large tin vessels containing the fluid, and about 100 phials of pure culture of "agar-agar." As soon as we had about reached the middle of the district we proposed to deal with, a quantity of the fluid was poured into a pot, which the owner willingly gave us, and the contents of some "agar-tubes" were added to it, that the fluid might be as strongly charged with bacilli as possible. The soldiers then summoned the peasants from the neighbouring villages, telling them to bring slices of bread with them, to this central spot, each bringing in a wicker basket a sufficient quantity of bread with him for the piece of land on which he worked. One after another went to the pot, and poured the contents of his basket into the fluid. The pieces of bread were then dipped down, and when they were sufficiently soaked, they were taken out of the pot with the hands and put back into the basket. In order to relieve the peasants of the doubts which they expressed whether the prepared bread might be poisonous to their sheep, the animals belonging to the establishment,—fowls, pigeons, dogs, pigs, horses, donkeys, sheep, and goats,—were all fed before their eyes with prepared pieces of bread; indeed some of the staff who divided the bread among the peasants ate pieces themselves in their presence, to show that it was harmless also to man. It is true I had made no previous experiments upon man, with the bacillus, but only expressed my opinion that I considered it improbable that any harm could result from the bacillus. But this declaration was quite sufficient to induce my companions, who were most zealous for the success of the undertaking, to try the experiment for themselves of eating some of the bread without more ado, in order to tranquilise the peasants. In short, all of us who had to dose the bread, as well as the peasants who had to divide it, served as objects of experiment; for disinfecting our hands, and the baskets used to carry the bread was, of course, out of the question.

All these experiments on men and animals proved (as I had expected from the result of my former trials) that, so far as they are concerned, the bacillus is wholly innocuous; it is operative only on the alimentary system of the house-mouse and field vole. After the peasants had been taught and shown what was to be done, they went as they were ordered to the fields, accompanied by soldiers, and carried out their instructions faithfully. We ourselves selected suitable posts for observation in different places, and applied the method there, in both the cultivated and fallow-fields. In this manner we succeeded, in a few days, in disseminating the prepared bread over the whole plain, north, east, and west of Larissa. At different places dozens of voles were inoculated with the pure culture by subcutaneous injection, and were liberated in the fields that they might spread the disease in the way already explained.

I cannot sufficiently express my grateful recognition of the hospitable reception which we received everywhere from the owners of the estates, and their stewards, and of the energy with which they urged the people to carry out the method practically. I am especially grateful to the owner of Bakrena, M. Kalamopolus, and his representative, M. Elias; the owners of the estates of Nechali, Demetriades, and Skaliora; and above all, to the director of the Stefanovic estates, Chassambali, Metesseli, Amarlar, Chadsimustafa, M. Anastassiades, who unwearyedly exerted himself to ensure the measures which I proposed being conscientiously carried out.

In a few days the supply of cultivated fluid and the pure culture on "agar" was exhausted. But after the method became known, those of the inhabitants who did not live too far from Larissa flocked to the town to obtain infected bread to take to their fields. This obliged us at once to recommence our preparation of the cultivated fluid. The Government Commissioners shared in the work. M. Ambelikopulos, in particular, took care to acquaint himself with all the details, so that he might be able to extend the use of the method through all Thessaly after our departure.

It was necessary to make a reliable experiment on a large scale in Thessaly with the fluid prepared at the house of M. Anastassiades. I entrusted this work to my assistant, Dr. Abel, there being doubtless a great abundance of field mice in the neighbourhood of Velestino, as we afterwards found to be the case when we visited the fields; and consequently this district seemed particularly suitable. I

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therefore sent Dr. Abel there with a supply of the freshly prepared material, and directed him to select a suitable field, to dig a ditch round it, and to sprinkle it with the prepared bread. Dr. Abel succeeded in discovering, through the friendly aid of M. Maire, of Velestino, and his assistant, M. Jourdan, a wheat field, about four hectars in extent, which was riddled with mouse-holes like a sieve. In order to isolate this field from its surroundings as far as possible, he had a furrow ploughed all round it, and immediately deepened this into a ditch. At the same time all the holes were charged with bread. By this method the following results were obtained:—After a few days news was received from all quarters that the bread which had been put into the holes had dissappeared, and therefore it was in the highest degree probable that the voles had eaten it. If this were the case, the result would be very satisfactory, according to the experiments made on a small scale. From the first I had awaited the results with great anxiety. I had not thought it very likely that the voles would eat the bread when they were surrounded with the tenderest grasses. On this account I expressed the opinion in the article already referred-to ("Centralblatt für Bakteriologie und Parisitenkunde," Band xi. p. 129) that spring and autumn were the most favourable seasons for attacking the voles by my method; that is, at seasons when their natural food was not over abundant. In Thessaly this period was long past, and the finest and tenderest grass was growing everywhere. The corn had already attained a height of half a metre and upwards. I was therefore all the more agreeably surprised when the news reached us that the bread had everywhere disappeared from the holes, even in the midst of the corn-fields. We could not expect final results until the expiration of at least four weeks, but after about nine days some of the consequences became apparent. In company with Dr. Pampoukis, who had been deputed by the Government, to assist us, and who had made things smooth for us everywhere, and of the landed proprietors, who were most interested, we made a tour of inspection at the expiration of the time mentioned to the places where we had ourselves applied the method, as well as to some where the proprietors assured us it had been undoubtedly carried out by the peasants. In Bakrena, where we had commenced the trial nine days previously, the devastations in the fields had ceased for two or three days. We were able to ascertain with certainty that freshly-eaten corn was no longer found in the holes; what was actually found was at least two days old. Besides, we saw no newly-opened mouse-holes. At several places all the holes had, at my request, been trodden down the evening previous to our visit. Not one of them had been reopened, as was otherwise invariably the case under similar circumstances. Several dead voles had been found by the peasants, but unfortunately they had not been preserved. It was just the same at Nechali and Amarlar. A number of the burrows were dug up; many were quite empty, and in others dead young were found, partly eaten. At other places dead voles were found just outside the burrows, or sticking in the holes; we also found half-dead ones moving about outside the holes in broad noonday, which they had never been seen to do at other times. This discovery of dead and dying voles outside the holes in broad daylight explained the reason why we seldom found dead ones when the burrows were opened. It seems that when the animals find themselves seriously ill they feel the need of fresh air; they abandon their holes and "runs," and are immediately pounced upon and devoured by the numerous mouse-eating birds in the neighbourhood. A number of dead and half-dead voles were taken back to Larissa, and were there examined; they all exhibited the pathological and anatomical changes of mouse-typhus, and all their organs, especially the liver and spleen, contained abundance of characteristic bacilli. Thus we conclusively proved the infection of the voles by means of the prepared bread. The method had satisfactorily borne the test of practical application. It was no longer necessary for me to remain in Thessaly, as I could entrust the further carrying out of the method to Dr. Pampoukis at Athens, and M. Ambelikopulos at Larissa. Dr. Pampoukis announced the satisfactory result of the experiment in a despatch forwarded to Athens. The Mayor of Larissa, M. Asteriades, gave a dinner in our honour, and expressed his pleasure at the success of our undertaking; and the Prefect, M. Kleomenes, who was present, also expressed his appreciation of the value of the new method. The President of the Committee, M. Anastassiades, was so convinced of the result that he telegraphed to countermand the further shipment of large quantities of bisulphide of carbon, which were lying at Marseilles to be forwarded to Thessaly. The Government Commissioners also recognised the success of the method.

After this we returned to Athens. I personally reported to his Excellency the Prime Minister, M. Konstantopulos, respecting the fortunate results of the experiment. I laid stress upon the pressing necessity for carrying out the method without delay throughout the whole of Thessaly. I expressed my confident opinion that there would be a very good harvest this year from the Thessalian corn-lands if they were saved from destruction by the voles through a speedy and widespread application of my method, which could easily be carried out; and finally expressed my desire that the Government would give Dr. Pampoukis, at Athens, and M. Ambelikopulos, at Larrissa, full powers and means to carry out the method in the way which I had shown them. His Excellency the Prime Minister then expressed to me the thanks of the Government, in the presence of M. Gennadius, the Director of the Agricultural Department of the Ministry, for having accepted the invitation, and for having successfully carried out my method in Thessaly for the benefit of Greece. His Excellency, M. Trikupis, who had paid special attention to the Thessalian vole-plague, and had learnt with great interest the particulars of my method, its easy application, cheapness, and effectiveness, also expressed his conviction, during a visit which we paid him, that we had rendered Thessaly and Greece a great service by practically conducting this novel undertaking. During the two following days which we were able to spend in Athens before our return to Germany, several telegrams were received from Thessaly, setting forth beyond doubt the successful results of the experiment from day to day. The Greek journals of all parties were unanimous in expressing their approval of my method, and their gratitude. Moreover, M. Gennadius, the Director of the Agricultural Department, and all the scientists connected with the Pathological Institute, who had energetically aided in the preliminary arrangements, expressed their pleasure at the complete success of the undertaking during a banquet which in the most friendly manner they gave in our honour.

We made our return journey *viâ* Constantinople. Shortly after our arrival I received a telegram from MM. Anastassiades and Kyriakos, giving information of the latest results of the experiment, as shown by the discovery of great numbers of dead and dying mice, and expressing their gratitude and good wishes. On my return to Greifswald I received no further news for a time. As i said before, the complete results could not be expected to manifest themselves for some weeks after the commencement of the practical application of the method. On May 26th I received, to my great satisfaction, the following despatch from the President of the Vole Committee at Larissa: "*Résultats excellents partout, pays réconnaissant à vous.—Anastassiades.*"

On May 28th I received a letter, dated on the 22nd, from M. Ambelikopulos at Volos, in which he expressed himself as follows:—"*Votre méthode marche très bien, elle nous a donné des résultats splendides; à Velestino, où nous avons fait un essai, on a trouvé beaucoup mais beaucoup de campagnols morts et assez de mangés dans la nuque.*"

Thus the hopes which I entertained when I discovered the bacillus, that it might prove of great importance in counteracting the damage amounting to many millions, caused by voles in several counties of Europe, have been fully and speedily confirmed. We now possess in the *Bacillus typhi murium*, a micro-organism which will infallibly kill this destructive rodent. The bacillus can be used in practice with the greatest ease, as it injures no other animal. It consequently fulfils the most comprehensive requirements necessary in a method of destroying voles. For the first time an injurious animal in Thessaly has been successfully and scientifically got rid of. Bacteriological science has again proved its vast practical importance, and has fully justified its claim to be studied and cultivated to the utmost extent.

Greifswald, 9th June 1892.

APPENDIX VII.

Account of a Plague of Field-mice observed in La Plata in 1872–73 by Mr. W. H. Hudson, and described by him in his *Naturalist in La Plata*, 1892, pp. 59–68.

For many years, while living in my own home on the pampas, I kept a journal, in which all my daily observations on the habits of animals and kindred matters were carefully noted. Turning back to 1872–3, I find my jottings for that season contain a history of one of those waves of life—for I can think of no better name for the phenomenon in question—that are of such frequent occurrence in thinly-settled regions, though in countries like England seen very rarely, and on a very limited scale. An exceptionally bounteous season, the accidental mitigation of a check, or other favourable circumstance, often causes an increase so sudden and inordinate of small prolific species, that when we actually witness it we are no longer suprised at the notion prevalent amongst the common people, that mice, frogs, crickets, &c., are occasionally rained down from the clouds.

In the summer of 1872–3 we had plenty of sunshine, with frequent showers; so that the hot months brought no dearth of wild flowers, as in most years. The abundance of flowers resulted in a wonderful increase of humble bees. I have never known them so plentiful before; in and about the plantation adjoining my house I found, during the season, no fewer than seventeen nests.

The season was also favourable for mice (*Hesperomys*); that is, of course, favourable for the time being, unfavourable in the long run, since the short-lived, undue preponderance of a species is invariably followed by a long period of undue depression. These prolific little creatures were soon so abundant that the dogs subsisted almost exclusively on them; the fowls also, from incessantly pursuing and killing them, became quite rapacious in their manner; whilst the Sulphur Tyrant-birds (*Pitangus*) and the Guira Cuckoos preyed on nothing but mice.

The domestic cats, as they invariably do in such plentiful seasons, absented themselves from the house, assuming all the habits of their wild congeners, and slinking from the sight of man—even of a former fireside companion—with a shy secrecy in their motions, an apparent affectation of fear, almost ludicrous to see. Foxes, weasels, and opossums fared sumptuously. Even for the common armadillo (*Dasypus villosus*) it was a season of affluence, for this creature is very adroit in capturing mice. This fact might seem surprising to anyone who marks the uncouth figure, toothless gums, and the motions —anything but light and graceful—of the armadillo; and perhaps fancying that, to be a dexterous mouser, an animal should bear some resemblance in habits and structure to the *felidæ*. But animals, like men, are compelled to adapt themselves to their surroundings; new habits are acquired, and the exact corelation between habit and structure is seldom maintained.

I kept an armadillo at this time, and good cheer and the sedentary life he led in captivity made him excessively fat; but the mousing exploits of even this individual were most interesting. Occasionally I took him into the fields to give him a taste of liberty, though at such times I always took the precaution to keep hold of a cord fastened to one of his hind legs; for as often as he came to a kennel of one of his wild fellows, he would attempt to escape into it. He invariably travelled with an ungainly trotting gait, carrying his nose, beagle-like, close to the ground. His sense of smell was exceedingly acute, and when near his prey he became agitated, and quickened his motions, pausing frequently to sniff the earth, till, discovering the exact spot where the mouse lurked, he would stop and creep cautiously to it; then, after slowly raising himself to a sitting posture, spring suddenly forwards, throwing his body like a trap over the mouse, or nest of mice, concealed beneath the grass.

* * * * * *

In the autumn of the year countless numbers of Storks (*Ciconia maguari* and of Short-eared Owls (*Otus brachyotus*) made their appearance. They had also come to assist at the general feast.

Remembering the opinion quoted by Darwin, that two-thirds of the humble bees in England are annually destroyed by mice, I determined to continue observing these insects, in order to ascertain whether the same thing occurred on the pampas. I carefully revisited all the nests I had found, and was amazed at the rapid disappearance of all the bees. I was quite convinced that the mice had devoured or driven them out, for the weather was still warm, and flowers and fruit on which humble bees feed were very abundant.

After cold weather set in the storks went away, probably on account of the scarcity of water, for the owls remained. So numerous were they during the winter that any evening after sunset I could count forty or fifty individuals circling over the trees about my house. Unfortunately they did not confine their attentions to the mice, but became destructive to the birds as well. I frequently watched them at dusk, beating about the trees and bushes in a systematic manner, often a dozen or more of them wheeling together about one tree, like so many moths about a candle, and one occasionally dashing through the branches until a pigeon—usually *Zenaida maculosa* —or other bird was scared from its perch. The instant the bird left the tree they would all give chase, disappearing in the darkness. I could not endure to see the havoc they were making amongst the Ovenbirds (*Furnarius rufus*— a species for which I have a regard and affection almost superstitious), so I began to shoot the marauders. Very soon, however, I found it was impossible to protect my little favourites. Night after night the owls mustered in their usual numbers, so rapidly were the gaps I made in their ranks refilled. I grew sick of the cruel war in which I had so hopelessly joined, and resolved, not without pain, to let things take their course. A singular circumstance was that the owls began to breed in the middle of winter. The field-labourers and boys found many nests with eggs and young birds in the neighbourhood. I saw one nest in July, our coldest month, with three half-grown young birds in it. They were excessively fat, and, though it was noonday, had their crops full. There were three mice and two young cavies (*Cavia Australis*) lying untouched in the nest.

The Short-eared Owl is of a wandering disposition, and performs long journeys at all seasons of the year in search of districts where food is abundant; and perhaps these winter-breeders came from a region where scarcity of prey, or some such cause, had prevented them from nesting at their usual time in summer.

The gradual increase or decrease continually going on in many species about us is little remarked; but the sudden infrequent appearance in vast numbers of large and comparatively rare species is regarded by most people as a very wonderful phenomenon, not easily explained. On the pampas whenever grasshoppers, mice, frogs, or crickets become excessively abundant we confidently look for the appearance of multitudes of the birds that prey on them. However obvious may be the cause of the first phenomenon—the sudden inordinate increase during a favourable year of a species always prolific—the attendant one always creates astonishment: For how, it is asked, do these large birds, seldom seen at other times, receive information in the distant regions they inhabit of an abundance of food in any particular locality? Years have perhaps passed during which scarcely an individual of these kinds has been seen; all at once armies of the majestic white storks are seen conspicuously marching about the plain in all directions; while the night air resounds with the solemn hootings of innumerable owls. It is plain that these birds have been drawn from over an immense area to one spot; and the question is how have they been drawn?

Many large birds possessing great powers of flight are, when not occupied with the business of propagation,

incessantly wandering from place to place in search of food. They are not, as a rule, regular migrants, for their wanderings begin and end irrespective of seasons, and where they find abundance they remain the whole year. They fly at a very great height, and traverse immense distances. When the favourite food of any one of these species is plentiful in any particular region all the individuals that discover it remain, and attract to them all of their kind passing overhead. This happens on the pampas with the Stork, the Short-eared Owl, the Hooded Gull and the Dominican or Black-backed Gull—the leading species among the feathered nomads; a few first appear like harbingers; these are presently joined by new-comers in considerable numbers, and before long they are in myriads. Inconceivable numbers of birds are, doubtless, in these regions, continually passing over us unseen.

* * * * * *

By August (1873) the owls had vanished, and they had, indeed, good cause for leaving. The winter had been one of continued drought; the dry grass and herbage of the preceding year had been consumed by the cattle and wild animals, or had turned to dust, and with the disappearance of their food and cover the mice had ceased to be. The famine-stricken cats sneaked back to the house. It was pitiful to see the little burrowing owls; for these birds not having the powerful wings and prescient instincts of the vagrant *Otus brachyotus*, are compelled to face the poverty from which the others escape. Just as abundance had before made the domestic cats wild, scarcity now made the burrowing owls tame and fearless of man. They were so reduced as scarcely to be able to fly, and hung about the houses all day long on the look-out for some stray morsel of food. I have frequently seen one alight and advance within two or three yards of the doorstep, probably attracted by the smell of roasted meat. The weather continued dry until late in spring, so reducing the sheep and cattle that incredible numbers perished during a month of cold and rainy weather that followed the drought.

How clearly we can see in all this that the tendency to multiply rapidly, so advantageous in normal seasons, becomes almost fatal to a species in seasons of exceptional abundance. Cover and food without limit enabled the mice to increase at such an amazing rate that the lesser checks interposed by predatory species were for a while inappreciable. But as the mice increased, so did their enemies. Insectivorous and other species acquired the habits of owls and weasels, preying exclusively on them; while to this innumerable army of residents was shortly added multitudes of wandering birds coming from distant regions. No sooner had the herbage perished, depriving the little victims of cover and food, than the effects of the war became apparent. In autumn the earth so teemed with them that one could scarcely walk anywhere without treading on mice; while out of every hollow weed-stalk lying on the ground dozens could be shaken; but so rapidly had they been devoured by the trained army of persecutors, that in spring it was hard to find a survivor, even in the barns and houses. The fact that species tend to increase in a geometrical ratio makes these great and sudden changes frequent in many regions of the earth; but it is not often they present themselves so vividly as in the foregoing instance, for here, scene after scene in one of Nature's silent passionless tragedies opens before us, countless myriads of highly organized beings rising into existence only to perish almost immediately, scarcely a hard-pressed remnant remaining after the great reaction to continue the species.

APPENDIX VIII.

Memorandum by the Chairman upon a Visit to Thessaly in January 1893.

Having received an intimation from the Board of Agriculture that it was desirable, in view of the favourable reports received of the result of Professor Loeffler's operations in Thessaly, that his system should receive a trial in Scotland, and that experiments should be undertaken under control of the Committee on Field Voles, I considered it desirable to make more searching inquiry into the success attending the distribution of *bacillus typhi-murium* in the plain of Larissa. I hesitated to invite my colleagues to undertake experiments in this country, which must have involved considerable expense, before exhausting every means of ascertaining what had been the measurable and undoubted results of those undertaken by the Greek Government. It seemed very doubtful whether a non-contagious disease could be communicated effectively to the voles infesting a pastoral district so large as that which has been affected in the South of Scotland. Accordingly I applied without delay for the sanction of the Treasury, which would enable our secretary, Mr. J. E. Harting, and myself, to proceed to Athens and Thessaly, in order to make personal investigation. Having obtained this, we started at once for the East.

On the 2nd January we had an interview with Monsieur Pasteur at his Institute and laboratory in Paris. We were anxious to obtain from that experienced bacteriologist advice as to proceeding in our inquiry into the propagation of the bacillus of mouse typhus, as well as, if possible, some expression of opinion formed on Professor Loeffler's reports. In respect of the latter, we found that M. Pasteur, while admitting freely the efficacy of the virus in destroying those individual mice which should actually swallow it, had some difficulty in understanding how, in the open country, a sufficient number of these animals could be made to partake of it so as to make an appreciable impression on the plague. Moreover, without throwing the slightest doubt on Professor Loeffler's skill or accuracy, or on the importance of his discovery of the bacillus of mouse typhus, M. Pasteur pointed out that there was nothing in the reports to prove either the final extirpation of the hordes of voles, or, if such had taken place, the connection between the employment of the virus and the disappearance of the voles. It was usual, he said, for these outbreaks to diminish either from natural causes or from epizootic disease, as suddenly as they arose; and it had not been established that Professor Loeffler's operations had done more than synchronise with the abatement of the plague.

Similarly guarded views were expressed by M. Pasteur's assistant, M. Metschnikoff.

On arriving in Athens we were received with the utmost cordiality by the Prime Minister, Monsieur Tricoupi; by the Minister of the Interior, Monsieur Theokotis; and by the Director of the Department of Agriculture, Monsieur Gennadius. The last-named gentleman expressed his readiness to accompany us to Thessaly, an offer of which we gladly availed ourselves.

On Tuesday, 17th January, the day fixed for our departure, a furious hurricane swept over Athens, accompanied by torrents of rain. Much damage was done by the wind to shipping, and among the olive groves all over Greece, the fields were inundated, and our steamer was delayed, so that we did not arrive at Volo till the morning of the 19th.

Here M. Gennadius, who speaks English with great fluency, obtained for us interviews with the Nomarch and several other gentlemen who had taken part in the efforts to put down the plague of voles in 1892. Among others were M. Topalis, the Mayor of Volo, M. Mathioudakis, Director of the Epirus and Thessaly Bank, M. Manousos, the proprietor of an estate at Velestino, which had been much overrun by voles, and M. Mouratoglous, Director of the School of Agriculture of Aidini. They all agreed in testifying to the efficacy of the Loeffler method as a direct though dilatory poison, and to its harmlessness to domestic animals and to human beings. But they were equally unanimous in the conclusion that in spite of its application the voles were still as numerous as ever on some parts of the land. In fact, we were informed that on that very morning a steamer was to leave Volo, hired by the Turkish landowners to bring holy water from Mecca, with which to sprinkle the infested district.

On arriving at Larissa that evening, we were received with great courtesy by the Demarch, who offered us

every assistance in our inquiry. Next morning, 20th January, we were introduced in his house to five landed proprietors, on whose estates the method of Professor Loeffler had been employed. They all spoke favourably of it as a safe substitute for poison, though not so immediate in its effects. One gentleman only of those present, M. Anastasiades, representing an estate of 7,500 acres, expressed himself satisfied with the final result of the experiments. His land had been cleared of voles, and it was his belief that, where carefully employed, the distribution of bread soaked in the *bouillon* of mouse typhus would be followed by the disappearance of the plague. He believed that, as asserted by Professor Loeffler, living voles acquired the disease by eating the corpses of those killed by it. On this point the evidence was unsatisfactory. No one appeared able to testify to having actually seen mice in a wild state devouring or devoured by their comrades, although in captivity that sometimes had been observed to take place.

Except M. Anastasiades, not one of the persons whom we met, either at Volo or Larissa, expressed any confidence in Professor Loeffler's method. They all agreed that mice or voles which swallowed a portion of fresh virus would die, but they did not believe in its communicability to those which had not so partaken.

It is fair to add that all agreed in their description of the supineness and inactivity of the peasantry in attempting to rid their land of the pest. Christians and Mahommedans alike viewed it as a visitation from the Almighty, inflicted at His pleasure and removable only by the same means.

The injection of the fumes of sulphide of carbon into the burrows of the voles was spoken of as having been thoroughly successful in those places where it had been employed. The disadvantages of this remedy are, (1) its costliness, and (2) the danger attending the use of such a violent explosive by unskilled peasantry. It is, moreover, injurious to those who apply it, though probably not permanently so; the men suffer from numbness and paralysis of the arms after they have been some time at work, and have to be relieved at the end of every second day. Moreover, this method is not practicable for the destruction of our Scottish vole (*Arvicola agrestis*), which unlike its Thessalian congener (*Arvicola Güntheri*) does not live in burrows, but among herbage on the surface.

We were not successful in obtaining living specimens of the voles. Unusually severe weather prevailed at the time of our visit; before we left, the great plain of Larissa was covered with snow. We saw innumerable burrows in the fields and along the railway embankment between Velestino and Larissa, but the animals were all under ground. Strong hopes were entertained by the natives that the cold and wet winter would destroy the plague, as it is said to have put an end to a similar visitation in 1866. If that be the result, no doubt the credit will be attributed by the Mahommedans to the virtue of Mecca water.

Specimens of dead voles preserved, though very imperfectly, in spirits were produced for our inspection, but they were altered by distention and discoloration almost beyond recognition.

The conclusion to which we have come as to the value of Professor Loeffler's discovery is not favourable to its introduction into Scotland. It seems to be as efficacious as mineral poison in destroying those voles or mice which partake of food steeped in the bacilliferous fluid, and it has the advantage of being innocuous to other forms of life. In other words, it may be regarded as a safe kind of poison. On the other hand, it is a material which cannot be stored ready for use. The fluid loses its virtue in about eight days after it has been prepared. Lastly, the cost of its application is prohibitive on land bearing such a rent as is charged on Scottish hill farms. The virus costs five drachmas (equal to about 4*s*.) per tube; each tube suffices for one hectare (equal to about two imperial acres). Obviously an expense of 2*s*. an acre, in addition to the bread used, is more than it would repay either landlord or tenant to apply to hill pasture. In Greece, the expense of providing the fluid has been borne by the Government, but it is doubtful if there is any precedent in this country for the public being charged with the cost of such an undertaking.

During the course of our inquiry in Scotland, many witnesses expressed the opinion that the excessive multiplication of voles had been the direct result of the destruction of birds and small beasts of prey in the interest of game-preserving. We received in Thessaly ample evidence to show that, however useful owls and certain hawks may be and undoubtedly are in restricting the number of mice and voles in ordinary seasons, they are wholly incapable of preventing the periodical appearance of swarms in exceptionally favourable seasons. No one in that country thinks of killing what British gamekeepers call "vermin." Kites, buzzards, kestrels, and other birds of prey are exceedingly abundant: indeed the Mahommedans (of whom there are still 30,000 in Thessaly) are very kind to all such animals, and protect them. We did not, however, see any of the short-eared owls, which assembled in such extraordinary numbers during the Scottish visitation.

In 1866, when the last visitation of voles came upon this plain, the land was Turkish territory; the idea, therefore, that Scotland would be exempt from similar visitations if game-preserving were unknown, must be dismissed as not in accordance with established facts.

Mr. Harting and I were made deeply sensible of the readiness shown by everyone, both officials and private individuals, to facilitate our inquiry, and we retain a most grateful sense of the kindness and hospitality which we received at Athens, Volo, and Larissa.

HERBERT EUSTACE MAXWELL,
Chairman.

PLATE I.

SHORT-TAILED VOLE. *Arvicola agrestis.*—The subject of the present enquiry. Locally known as Vole, Field Mouse, Grass Mouse, and Meadow Mouse. Colour, reddish-brown above, paler beneath. Average length of head and body, 4 ins.; tail, 1 in. External distinguishing characters, short rounded muzzle; short ears, almost buried in the fur; short hairy tail.

LONG-TAILED FIELD MOUSE. *Mus sylvaticus.*—Colour, sandy-brown above, white beneath. Average length of head and body 4½ ins.; tail, 4 ins. External distinguishing characters, long pointed muzzle, prominent naked ears, and long naked tail.

PLATE II.

WEASEL. *Mustela vulgaris.*—Locally known as Whittret, Cane, and Mouse-hunt. Average length of head and body, 7 to 8¼ ins.; tail, 2 to 2½ ins. Colour, reddish-brown above, white beneath; tail, brown. Does not turn white in winter. A persistent enemy to rats, mice, and voles.

STOAT. *Mustela erminea.*—Locally known as Weasel, Stoat, Clubster, Lobster, and Ermine (in winter). General colour, brown above, white beneath. Tail longer than in Weasel, and with a black tip at all seasons, even in winter, when the fur becomes white or partially so. Average length of head and body, 9 to 10½ ins.; tail, 4½ to 6 ins. Preys on mice, voles, rats, rabbits, leverets, and young game-birds.

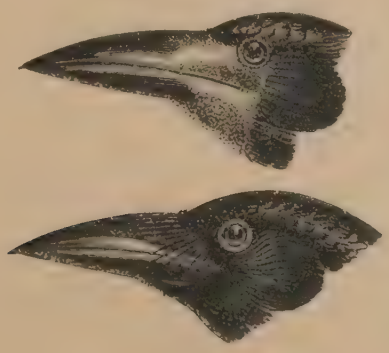
PLATE III.

KESTREL OR WINDHOVER. *Falco tinnunculus.*—Locally known as the Brown or Red Hawk. A long-winged, dark-eyed Hawk, with reddish-brown back and bluish-grey head and tail when adult. Preys upon mice, voles, beetles, grasshoppers, small birds, and occasionally young game-birds. Easily recognised on the wing by its habit of hovering over the fields.

SPARROWHAWK. *Accipiter nisus.*—Locally known as the "Round-wing" or "Blue Hawk."—A short-winged yellow-eyed Hawk with long barred tail. Mottled brown above when young, browner grey when adult. White underpark, with transverse bars on breast and flanks. Preys upon small birds, black-birds, thrushes, pigeons, and young game-birds. Does not hover like the Kestrel.

Plate IV.

SHORT-EARED OWL. *Otus brachyotus.*—Migratory, living much on the ground, and of diurnal habits. General colour above yellowish-brown, variegated with spots, streaks, and cross-bars of a darker colour; pale beneath. Eyes yellow. (The eyes of the White or Barn Owl and the Brown or Tawny Owl are black.) Appears usually in October (whence called Woodcock Owl) and remains until April. A few remain to breed annually in suitable situations. Preys largely on mice and voles. During the present plague of field voles an unusual number of these birds appeared, and a great many nests were found.



HEADS OF OLD AND YOUNG ROOK. *Corvus frugilegus.*—The former with bare face, the latter feathered to base of bill like the Carrion Crow or Corbie. Rooks are very useful in digging out and destroying the nests of field voles and devouring the young. As a rule the young rook loses the feathers at the base of the bill at its first moult, when it assumes the bare face of the adult; but the heads of several two-year-old birds were exhibited to the Committee in which this change had not taken place—a peculiarity which was thought by the exhibitor to be correlated with an observed development of carnivorous habits. *See* Report, p. xii.

MAP

to accompany Report on

PLAGUE OF FIELD MICE OR VOLES.

1892.

Scale of Statute Miles

0 1 2 3 4 5 10 20 30

London: Stanford's Geog.l Estab.t

BOARD OF AGRICULTURE.

REPORT

ON

FURTHER EXPERIMENTS

IN

CHECKING POTATO DISEASE

IN THE

UNITED KINGDOM AND ABROAD.

(In continuation of Parliamentary Paper C. 6647 of 1892.)

1893.

Presented to both Houses of Parliament by Command of Her Majesty.

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REPORT

ON

FURTHER EXPERIMENTS

IN

CHECKING POTATO DISEASE.

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PART II.

Experiments in checking Potato Disease in Foreign Countries.

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MEMORANDUM.

The experiments on the use of *bouillie bordelaise* as a remedy against potato disease, which were conducted in the United Kingdom and abroad in 1891, formed the subject of a special report which the Board of Agriculture laid before Parliament in 1892 (C. 6647). The following summaries of later experiments of the same class have been prepared in continuation of the information then given.

Although the potato-disease was not prevalent to any considerable extent in Europe in 1892, except in some districts in Ireland, it was present in England and some parts of the Continent in a sufficient degree for the purpose of the further experiments that were carried on in various places to test the preventive or remedial action of sulphate of copper compositions. The results of the later experiments confirm the experience of previous trials and show that the treatment of potato plants with bouillies of sulphate of copper operates in certain circumstances as a check to the malignant affection caused by the fungus, *phytophthora infestans*.

The experiments of 1892 as recorded in the accompanying reports, especially those in England and Ireland, indicate a distinct improvement in the making and applying of the bouillies, as well as in formulating the quantities of their ingredients, and in assessing the cost of their application.

Taking first the experiments carried on for the Board of Agriculture by the Royal Agricultural Society of England, it is seen that although the dressings with bouillie bordelaise did not entirely prevent the potato-disease, they had a marked effect in lessening the extent to which it spread, and gave an increase of crop which more than paid for the cost of treatment. From the conclusions derived from these experiments it is also gathered that treatment with sulphate of copper bouillies serves to arrest the spread of the disease sufficiently, as a rule, to pay for the cost of treatment.

From the careful experiments conducted by the same Society at the Woburn experimental farm, under the superintendence of Dr. Voelcker, it is shown that the application of sulphate of copper compositions had not an entirely preventive effect, but that it lessened the amount of disease when it was made early. On the other hand, when these compositions were used curatively, that is, when the disease had appeared, they had no material influence upon it. But as Dr. Voelcker remarks, it must be borne in mind that the season of 1892 was one in which disease was not by any means rife, and that when it appeared it was very late in the season: he adds "Seeing that the early

" dressing was most effectual where disease occurred the most, " it is a fair deduction that in a season when disease showed " itself badly, the dressing would give even more favourable " results than those now set forth."

The value of the treatment with bouillies of sulphate of copper is strikingly illustrated by the experiments carried on by the Technical Education Committee of the Wiltshire County Council, in which the average gain on the treated plots was equal to 2 tons 11 cwt. per acre.

In Messrs. Carters' trials at Bromley, bouillie bordelaise operated as a great preventive of disease, for out of 10 plots dressed in July and August six wholly escaped disease, and in the other four the amount of disease was infinitesimal, so that in a total yield of 22 cwt. 3 qrs. 26 lb. on these 10 plots, there were only 2¾ lbs of diseased tubers. Upon the untreated (control) 10 plots, in a yield of 14 cwt. 1 lb. there were 3 cwt. 1 qr. 11 lbs. of diseased potatoes.

With respect to the experiments made by the Agricultural Department of the Irish Land Commission it appears that there was disease present more or less in all the districts where the experiments were conducted. On all of the experimental plots that were not treated with sulphate of copper compositions disease showed itself in ratios of from 2·9 to 15·7 per cent. of the total yield of tubers.

On six of the plots treated with bouillie bordelaise there was absolutely no disease, and on the others the weight of diseased tubers ranged from ·03 to 11·0 per cent. of the entire crop.

Other experiments carried out in Ireland show that at the Albert Model Farm, Glasnevin, on four treated plots sown with a variety of potatoes (Kemp's) liable to disease, the average quantity of diseased tubers was 34·36 per cent., as against 60 per cent. upon an untreated plot. At the Munster Agricultural School the average quantity of diseased tubers in three sets of treated plots was 7·0 per cent., against 10·5 on untreated plots.

Of the foreign trials it may be remarked that Dr. Petermann's experiments in Belgium appear to demonstrate that treatment with bouillie bordelaise not only materially counteracts the injury from potato disease, but that such treatment increases the yield, and materially increases the quantity of starch in the tubers.

M. Girard's investigations confirm the conclusions arrived at by Dr. Petermann. In his report on the experiments conducted in 1891, M. Girard points out that when a field is badly attacked by the disease the weight of the crop from the dressed plots is always greater than that from the untreated plots, but in the absence of disease, certain disease-resisting varieties of potatoes may yield a slightly diminished crop under the preventive treatment. Nevertheless, M. Girard observes that it is always advisable to apply the dressing, as it is never safe to assume that the disease will not make its appearance.

The interesting experiments made by Dr. Steglich at Dresden with six different varieties of potatoes treated with bouillie bordelaise exhibited an average increase in the value of the crop of all the varieties, amounting to 2*l.* 3*s.* 9*d.* per acre over and above the value of the crop of an acre not treated. In each case the cost of treatment, 13*s.* 8*d.* per acre, was deducted. And in another experiment, on a larger scale, by Dr. Steglich the net profit obtained by treatment with bouillie bordelaise amounted to 2*l.* 14*s.* 1*d.* per acre.

On the other hand, it will be observed that the experience of Dr. Liebscher of the Agricultural Institute attached to Göttingen University, shows that the dressings with bouillie bordelaise actually injured the foliage of healthy plants and reduced their yield by about 20 per cent. This is the most unfavourable testimony to the use of sulphate of copper composition for potato-disease that has yet been recorded. It is, it must be said, most difficult to understand how the comparatively weak solution of only 15 lbs. of sulphate of copper to 100 gallons of water, as used by Dr. Liebscher, could injure the plants in the manner described, seeing that much stronger solutions have been applied constantly without any injurious effect upon the leaves.

It should be borne in mind, however, that this unsatisfactory result was obtained in an exceptionally dry season, when the disease did not make its appearance at Göttingen. And Dr. Liebscher points out that although the dressing may injure the plants, it is much more injurious to the *phytophthora infestans*, so that in years in which the disease is prevalent the final results of the application of bouillie bordelaise may be represented by a favourable effect on the yield of the crop.

In his comments on Dr. Liebscher's unsuccessful experiment in 1892, Dr. Steglich remarks that, as there can be no doubt that the solutions used were properly prepared, it must be concluded that a very strong concentration of the copper, which may arise in consequence of excessive heat and absence of dew if the treatment is carried out on a particularly hot day or during the hottest part of the day, is injurious to the potato plants.

A review of the experiments carried out during the last few years indicates that the preventive treatment with bouillies of sulphate of copper has been employed with satisfactory results in most cases in seasons of disease, but the treatment has not an unbroken record of success. In seasons when the disease was absent the application of these dressings to potatoes has in a few cases appeared to have an injurious effect upon the yields of the crops.

On the whole, there is ample evidence to show that when the *phytophthora infestans* has once made its appearance the plants which have been previously treated with the bouillies offer more resistance to the attacks of the fungus than plants not so treated, and it would seem to be equally clear that when the

dressings are applied immediately after the plants exhibit signs of the affection they have the power of arresting the progress of the disease in a considerable degree.

The Composition of Bouillies.

Taking first the bouillie bordelaise sucrée, or bouillie with molasses, recommended by M. Girard as making the bouillie adhere to the leaves, the best mixture consists of—

20 lbs. of sulphate of copper,
20 lbs of lime, unslaked,
20 lbs. of molasses,
100 gallons of water.

The molasses is first mixed with water in a wooden tub, and the lime slaked in water is added to this. The sulphate of copper is dissolved in a separate wooden tub full of water, being first put in a bag of coarse sacking suspended over the side, the solution is then added to the lime and molasses. As Dr. Voelcker points out, an intense blue colour is obtained if the bouillie is properly prepared. If the molasses is put first and the sulphate of copper and lime added, sub-oxide of copper is formed, and the mixture becomes yellow and then red. It does not appear, however, from the various experiments recorded, that the bouillie bordelaise sucrée adheres better to the leaves than ordinary bouillie bordelaise, nor that it has any special advantage over this.

There have been several modifications in the manufacture of ordinary bouillie bordelaise. The original formula, and that adopted in the experiments of the Royal Agricultural Society was—

20 lbs. of sulphate of copper,
10 lbs. of lime,
100 gallons of water.

In 1892 M. Girard stated that it was better to use the same weight of lime as of sulphate of copper, and this prescription was adopted by Dr. Voelcker at Woburn, and by Messrs. Carter & Co. at Bromley, so that their formula was—

20 lbs. of sulphate of copper,
20 lbs of lime,
100 gallons of water.

The sulphate of copper was dissolved in the same manner as for the bouillie sucrée, and mixed with the lime solution, showing also a blue liquor, indicating that the whole of the copper had been precipitated.

Upon the question of the quantity of lime necessary to neutralize the acid and to cause a complete precipitation of the copper, much of course depends upon the purity of the lime. In he Irish experiments lime was used in the proportion of ½ lb.

to 1 lb. of sulphate of copper, and of ½ lb. of lime to 1 lb of sulphate of copper, it being found that the latter small proportion was quite sufficient if the lime was pure.

When the bouillie is mixed and diluted to the proper strength it may be conveyed to the potato field in a water-barrel from the tap of which the knapsack machines can be easily filled. For the horse machines it would have to be run into tubs from the water-barrel.

The quantity of solution used in the experiments varied from 100 to 220 gallons per acre, and depended probably to some extent upon the time of application and the quantity of foliage of the plants. Dr. Voelcker thinks that 120 gallons may be taken as a fair quantity for an average crop. And it may be considered that from 100 to 120 gallons is sufficient for a first dressing, and from 120 to 160 for a second dressing.

The machines used were the Éclair (knapsack), and Strawson's Antipest (knapsack). With these a man can dress from one-third to one-half an acre per day. A horse machine, invented by Mr. Strawson, has lately been much improved. By this the under side of the leaves can be well sprayed.

From five to seven acres can be sprayed in a day by this machine which takes one horse, and covers 78 rows at a time.

The cost of dressing, as given by the reporters in England, runs from 8*s.* 4*d.* to 9*s.* 10*d.* for one application. This depends upon the price of labour in the district, and the quantity of bouillie required. In Ireland the cost ranged from 7*s.* 8½*d.* to 9*s.* 1½*d.* per acre for each application.

The cost of dressing with bouillie sucrée amounts to 2*s.* or so per acre more.

Two applications were generally made; one towards the end of June, and another towards the end of July, especially where it was noticed that the sulphate of copper had been washed off.

Board of Agriculture,
4, Whitehall Place, S.W
September 1893.

PART I.

Experiments in Checking Potato Disease in Great Britain and Ireland.

Report on the Experiments with Bouillie Bordelaise, carried on in 1892 by the Royal Agricultural Society of England for the Board of Agriculture.

Experiments by the Royal Agricultural Society.

In their Report on Experiments for Checking Potato Disease, 1892 (C. 6647), the Board of Agriculture published the results of a series of trials with copper remedies for potato fungus carried out, on behalf of the Board, in the summer of 1891 in different parts of England and Wales by the Royal Agricultural Society of England.

The results of these experiments were of a valuable and practical nature; but in view of the conflicting experiences of investigations in the United Kingdom and elsewhere it was considered desirable that the experiments should be renewed in the following season. Early in 1892 the Board intimated to the Royal Agricultural Society their willingness to co-operate in a further series of experiments to be conducted in the summer of that year in accordance with a scheme drawn up by the Seeds and Plants Committee of the Society in the following terms:—

Scheme of Potato Experiments to be carried out by Royal Agricultural Society in 1892.

Scheme of Experiments.

Districts.—Six different localities to be chosen, five in England—viz, in the counties of Kent, Beds, Devon, Lincoln, and Cheshire, and one in (South) Wales.

Variety of Potato.—Wherever possible, experiments to be made on *one and the same* selected farm, with (*a*) an early variety of potato; (*b*) the main crop; (*c*) a late variety. If this should be impossible, the three crops to be selected on different farms in the same locality, as near to one another as possible. If it be impossible to obtain the three different crops in the same locality, the experiment must be confined to two crops, or even one.

Size and Number of Plots.—The minimum size of an experimental plot to be ¼ acre. The size recommended is ½ acre.

Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

Each experiment on any one variety of potato to consist of three plots :—

Plot A.—For *early* application of the bouillie.
Plot B.—For *late* application of the bouillie.
Plot C.—To be left *untreated*.

Thus, if all three crops (early variety, main crop, late variety) are available on a farm, there should be nine plots in the experiment ; if only two crops are available, then six plots ; if only one crop, then three plots.

Arrangement with Experimenters.—The Society will undertake to pay the expenses of purchasing and forwarding sulphate of copper and lime, as also all reasonable expenses for labour of application of dressing, carriage hire, &c., but cannot undertake responsibility for any loss of crop.

Superintendence of Experiments.—The Society will provide for the necessary superintendence at the time when the bouillie bordelaise is applied to the potatoes, and also when the weighing of the crop takes place. The services of a farm labourer will be required at each experimental station for the actual application of the dressings under the direction of the superintendent.

The report of the Committee on the results of these experiments of 1892 was transmitted to the Board in the January of the following year and is reproduced below.

Experiments of 1892.

Report on Experiments of 1892.

In 1892 six different potato-growing localities were chosen, viz. in Kent, Bedfordshire, Lincolnshire, Cheshire, Devonshire, and South Wales, these being the same counties as were selected in 1891, but, with the exception of Messrs. Malden's farm in Bedfordshire, fresh districts were in each case chosen for the experiments of 1891–2.

The names of those who kindly undertook to carry out the experiments were :—

Mr. Thomas Scott, Ditton Court, Maidstone, Kent.
Messrs. Malden Bros., Cardington, Beds.
Mr. G. C. Healey, Deeping St. Nicholas, Spalding, Lincolnshire.
Lord Egerton of Tatton, Tatton Park, Knutsford, Cheshire.
Mr. W. P. Vosper, Merafield, Plympton, Devonshire.
Mr. Thomas Brown, Kingswood Farm, Pembroke Dock, S. Wales.

The superintendence of the experiments was entrusted to Mr. Henry Giles, whose services were most kindly lent to the Society by Mr. Garrett Taylor, of Norwich, though at considerable personal inconvenience. Mr. Giles visited each experimental station whenever necessary, and saw to the preparation of the bouillie bordelaise and its different applications to the crops, as well as to the final weighings of the produce. Mr. Giles's duties were discharged with the promptitude and careful attention which he has shown in the practical work of the experiments of the

Norfolk Chamber of Agriculture, and his management of the present series was in every way satisfactory. Mr. Carruthers, the Society's consulting botanist, examined the different samples of leaves which, according to instructions, were sent up from any of the stations at which disease was believed to have made its appearance. In addition, Mr. Carruthers devoted some ground by the side of his house to the carrying on of observations upon the progress of the disease and on the nature of the action of the bouillie bordelaise upon the parasitic fungus (*phytophthora infestans*) attacking the potato.

EXPERIMENTS IN GREAT BRITAIN.

Experiments by the Royal Agricultural Society.

In 1891 only a single variety was experimented upon at each station, but the present series was considerably more extensive, and the endeavour was made to secure at each station not one crop only, but three different ones, representing respectively :—

Three varieties of potatoes.

(*a.*) An early variety of potato.
(*b.*) A medium variety.
(*c.*) A late variety.

At the same time it was felt not to be desirable to interfere with local considerations, and, accordingly, it was not laid down what particular varieties should be grown, but inquiries were made with a view of selecting those growers who would in the ordinary course have grown more than one kind of crop. Consequently, the varieties chosen were those which were in ordinary use in each locality.

It was further arranged to have in the case of each variety of potato three plots set aside for the experiment, as follows :—

Plot A for early application of the bouillie (before any disease appeared).

Plot B for late application of the bouillie (immediately upon disease making its appearance).

Plot C to be left untreated.

The maximum size of the plots was to be half an acre, the minimum size one-quarter acre, and they were to be divided off from the rest of the field, and from one another by small paths, so as to keep them distinct.

The composition and strength of the bouillie bordelaise mixture was the same as in the preceding year, viz :—

Composition of bouillie.

20 lb. sulphate of copper,
10 lb. lime (unslaked),
100 gallons water,

this being, accordingly, a two per-cent. strength solution of sulphate of copper. Particular care was taken to employ good and pure materials, more especially as some experiments conducted by other societies in the previous year were believed to have failed owing to the impurity of the materials used. The sulphate of copper was tested by Dr. Voelcker previous to the sending out of ½ cwt. kegs of it to each experimenter. Samples of the lime locally obtained and intended to be used were also sent to Dr. Voelcker, whose examination of them proved very necessary,

Experiments in Great Britain.

as, in three cases out of the six, the samples first sent were unsuitable, they being either not properly burnt, or already slaked or otherwise impure. Ultimately, good lots were obtained at all the stations, though in some cases the lime had to come from other districts.

Experiments by the Royal Agricultural Society.

Machine used for distributing dressings.

The machine used for distribution of the bouillie was the "Éclair" machine of M. Vermorel, obtained from Messrs. Charles Clarke & Co., Windsor Chambers, 33, Great St. Helens, London, E.C. A slight lengthening of the tube carrying the nozzle for spraying was found desirable in order to distribute the dressing well on the underside of the leaves of the plant. The bouillie was made as before, by roughly pounding the sulphate of copper crystals, placing them in a bag suspended in a wooden tub containing water, slaking the lime with water, and, when cool, pouring it, stirred up in water, into the sulphate of copper solution, a sieve being interposed to hold back any lumps, stones, &c., which might be in it and so tend to block up the spraying machine. By having the materials quite cool when mixed, and by keeping the liquid constantly stirred during the mixing, no difficulty was experienced in getting the bright-blue colour characteristic of properly made bouillie, as well as the rapid settling down of a whitish-blue deposit which left above it a quite clear, colourless liquid, containing no copper, the latter being entirely thrown down in the deposit.

Preparation of dressings.

Varieties of potatoes.

The different varieties of potato experimented on were :—

(*a.*) Early varieties	-	Beauty of Hebron (Kent and Pembroke).
		Myatt's (Lincolnshire).
(*b.*) Medium varieties	-	Snowdrop (Kent and Lincolnshire).
		White Elephant (Beds and Pembroke).
		Abundance (Cheshire).
(*c.*) Late varieties	-	Magnum Bonum (Kent. Lincolnshire, Devon).
		Imperator (Beds).
		Bruce (Devon and Cheshire).
		Irish Flounder (Pembroke).

The above distinctions are, of course, not absolute, a crop being considered "medium" in one district whilst it may be relatively "late" in another. Thus, the Magnum is considered a "medium" crop, in Devon, relatively to the "later" crop Bruce, although it generally ranks as a "late" or "main" crop.

Period of application of dressing.

Profiting by the experience furnished last year, the intention was to apply the first or "early" application of the bouillie to the A plots about a fortnight before the time at which experience told the experimenters that the disease might be expected to appear on each crop.

Mr. Giles's visits were arranged in accordance with this plan, and inquiries were made from time to time as to the progress of of the crops and the likelihood of the appearing of disease.

In every case the A plots were sprayed well in advance of the outbreak of disease, and the B plots as soon after notification of the appearance of disease as was possible, Mr. Giles at once proceeding to the spot on receipt of telegraphic notice.

Experiments by the Royal Agricultural Society.

Two of the experimenters [Mr. Scott and Mr. J. T. Smith (for Lord Egerton)] varied the inquiry and increased its interest by dividing the A plots (early dressing) into two halves, giving one half a single application only of the dressing, and two applications to the other half. At Messrs. Malden's the A plots of the White Elephant were dressed once only, but the Imperator twice. At Mr. Healey's the A's were all dressed twice, but only once at Mr. Vosper's and at Mr. Brown's. In no case were the B plots (late application) dressed more than once, namely, on the appearance of disease.

Cost of application.

The cost of the application varied, of course, with the number of times it was put on, and the amount of foliage. For an early first dressing, from 100 to 120 gallons per acre were generally used, and 120 gallons for a second early application; for the B plots (late application) 120–140 gallons was the usual amount, but in one case (Mr. Healey's, Magnum), where the tops were very luxuriant, as much as 200 gallons was required. The sulphate of copper cost 18*s.* a cwt. and the lime about 10*s.* a ton, whilst the actual work of spraying may be put at 5*s.* per acre. A single application of 100 gallons per acre would accordingly cost about 3*s.* 4*d.* for material and 5*s.* for labour, altogether 8*s.* 4*d.*; one of 120 gallons 9*s.* altogether; one of 140 gallons 9*s.* 8*d.*, and a dressing, first of 100 gallons, and then another of 120 gallons, would cost 17*s.* 4*d.* per acre altogether. In the case of Mr. Vosper's (Devon) experiments, owing to a misunderstanding, the B plots (late application) were not dressed at all, and Mr. Giles, not having been informed of the appearance of disease, did not go there a second time. In one other instance, Mr. Giles did not dress the B plots (late application), namely, at Mr. Brown's, Pembroke Dock. Here no disease appeared at all on two of the three crops, and, thus, for the purposes of the inquiry the results might be omitted from consideration. As to the third variety, there was some uncertainty about the existence of disease, and Mr. Brown weighed the crops himself. The several experiments may now be treated of in their order. The particulars as to quantities applied, dates of application, &c., are given in the tables.

Gain in crop from dressing.

In comparing the gain in crop with the cost of dressing it will be seen that, taking the crop at about 55*s.* a ton all round, an increase of 4 cwt. per acre in crop would pay for a dressing costing 10*s.*, and an increase of 7 cwt. per acre for one costing 18*s.* an acre.

1. *Kent.—Mr. Thomas Scotts' Farm.*

Experiments in Kent.

Mr. Scott was anxious to try the difference between giving the crop one and two dressings, applied early, and this was

Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

accordingly done. Disease appeared on the Beauty of Hebron and Snowdrop before it did on the Magnum. It was less marked on the earlier than on the later dressed plots. The Magnum had particularly luxuriant haulms, and the tops of the A plots that had been twice dressed early remained growing after those on the other plots had died off.

The potatoes were weighed on September 28.

Beauty of Hebron.—From the results obtained it will be noticed that there was not entire prevention of disease, but a marked diminution in it by the early dressing, for, whereas the untreated plot had 29 per cent. of diseased tubers, there was only from 2 to 4 per cent. on the early-dressed plots. Together with this was an increase in crop of over 3 tons per acre, and the application consequently paid excellently. The plot singly dressed had rather more disease, but a somewhat increased crop. The late application seemed both to increase the crop and to lessen disease, but, while it paid well it was not so remunerative as the earlier dressing.

TABLE I.—KENT.

Dressings per Acre.	Sound Tubers per Acre.	Diseased Tubers per Acre.	Per-centage of Disease.	Increase of Crop per Acre, Sound Tubers.	Cost of Dressing per Acre.
BEAUTY OF HERRON.					
A 100 gals., June 29	T. c. q. lb. 10 0 0 0	T. c. q. lb. 0 8 0 0	Per cent. 3·84	T. c. q. lb. 3 8 0 0	*s. d.* 8 4
Aa { 100 „ „ „ / 120 „ Aug. 4 }	9 18 0 0	0 4 0 0	1·98	3 6 0 0	17 3
B 120 „ „ „	8 14 0 0	2 0 0 0	18·89	2 2 0 0	9 0
C ——	6 12 0 0	2 14 1 4	29·14	—	—
SNOWDROP.					
A 100 gals., June 29	9 18 2 8	0 16 0 0	7·45	3 7 3 20	8 4
Aa { 100 „ „ „ / 120 „ Aug. 4 }	11 2 3 4	0 8 0 0	3·46	4 12 0 12	17 4
B 120 „ „ „	7 17 0 20	1 6 0 0	14·19	1 6 2 4	9 0
C ——	6 10 2 16	2 16 0 0	30·00	—	—
MAGNUM BONUM.					
A 120 gals., July 15	10 5 2 24	0 4 1 4	2·04	0 10 1 4	0
Aa { 120 „ „ „ / 120 „ Aug. 4 }	11 16 0 0	—	None	2 0 2 8	18 0
B 120 „ „ 20	9 13 1 20	0 3 1 20	1·74	0 2 0 0 [decrease]	9 0
C ——	9 15 1 20	0 4 0 0	2·00	—	—

Plot A, early application; B, late application; C, untreated.

Snowdrop.—Early applications lessened disease from 30 per cent. to 3·5 and 7·5 per cent., a largely increased crop also resulting. The advantage was with the double dressing. Late dressing also increased the crop, paying for the application, and it lowered disease from 30 per cent. to 14 per cent.

Experiment in Great Britain.

Experiments by the Royal Agricultural Society.

Magnum.—This crop had very little disease, and on the plot dressed twice before disease came there was entire absence of disease. There was some gain of crop, more than enough to pay the cost of application from the early dressings, the double dressing being the better. A small decrease of crop resulted from late application. Owing to the small extent to which disease prevailed, the influence of the dressing on prevention of disease is not marked.

The general result of Mr. Scott's experiments is to show a marked lessening of disease and also increase of crop from dressing the plots early, a double dressing before disease appeared being, on the whole, the best. The late applications had a less marked effect, though in the same direction, and there was only one case of loss through the applications, and that a very slight one.

Less disease and increase in crop from dressing.

2. *Bedford.—Messrs. Malden Brothers' Farm.*

There was not much disease here. The crops were weighed September 21 (White Elephant), and November 8 (Imperator). With the White Elephant, an early dressing reduced disease from 5·5 per cent. to ·05 per cent., and gave also a paying increase of crop. A still larger gain of crop was obtained by the later dressing, but there was more disease. Both applications were effectual. With the Imperator a lessening of disease from 3·28 per cent. to ·80 per cent., together with large increase of crop, was obtained by the early dressing applied twice, but the later application showed neither lowering of disease nor gain of crop.

Experiments in Bedford.

TABLE II.—BEDFORDSHIRE.

Dressings per Acre.	Sound Tubers per Acre.	Diseased Tubers per Acre.	Per-centage of Disease.	Increase of Crop per Acre, Sound Tubers.	Cost of Dressing per Acre.
WHITE ELEPHANT.					
A 120 gals., July 14 -	T. c. q. lb. 7 7 2 5	T. c. q. lb. 0 0 2 25	per cent. ·05	T. c. q. lb. 0 19 0 4	*s. d.* 9 0
B 135 „ Aug. 16 -	8 14 2 21	0 2 1 26	1·40	2 6 1 12	9 6
C ——	6 8 1 9	0 7 1 24	5·49	—	—
IMPERATOR.					
A { 120 gals., July 27 / 120 „ Sept. 5 } -	12 6 0 0	0 2 0 0	·80	3 9 2 0	18 0
B 120 „ „ „ -	7 18 2 0	0 4 1 12	3·73	0 18 0 0 [decrease]	9 0
C ——	8 16 2 0	0 6 0 0	3·28	—	—

Plot A, early application; B, late application; C, untreated.

Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

The general result here is to show the efficacy of an early dressing, applied once or, if necessary, twice, both in lessening disease and in increasing crop.

3. *Lincolnshire.—Mr. G. C. Healey's Farm.*

Experiments in Lincolnshire.

Disease was but slight with the Myatt's Ashleaf, rather more with Snowdrop, and entirely absent in the case of the

TABLE III.—LINCOLNSHIRE.

Dressings per Acre.	Sound Tubers per Acre.	Diseased Tubers per Acre.	Per-centage of Disease.	Increase of Crop per Acre, Sound Tubers.	Cost of Dressing per Acre.
MYATT'S ASHLEAF.					
	T. c. q. lb.	T. c. q. lb.	Per cent.	T. c. q. lb.	*s. d.*
A { 90 gals., July 21 / 100 „ Aug. 6 } -	7 5 2 0	0 3 0 0	2·02	0 11 2 0	16 3
B 120 „ „ -	6 13 0 0	0 4 0 0	2·81	0 4 0 0	9 0
C ——	6 14 0 0	0 4 2 0	2·13	—	—
SNOWDROP.					
A { 120 gals., July 21 / 100 „ Aug. 6 } -	9 11 0 0	0 1 0 0	·52	2 17 0 0	17 3
B 120 „ „ -	7 14 0 0	0 6 0 0	3·75	1 0 0 0	9 0
C ——	6 14 0 0	0 13 0 0	9·40	—	—
MAGNUM BONUM.					
A { 90 gals., July 21 / 120 „ Aug. 6 } -	10 7 2 0	None	—	2 15 2 0	17 0
B 200 „ „ 21 -	8 8 0 0	„	—	0 16 0 0	16 8
C ——	7 12 0 0	„	—	—	—

Plot A, early application; B, late Application; C, untreated.

Results of early and late application.

Magnum. No lessening of disease occurred in the case of the Myatt's, but a slight increase of crop (which just covered the cost of application) was obtainable from both early and late dressings. With the Snowdrop, an early application reduced disease from 9·4 per cent. to ½ per cent. and largely increased the crop. The later application, though not so successful either in lessening disease or in increasing the crop, still paid well for using it.

In the case of the Magnum, as there was was no disease to check, the crop increases alone need be taken, the early application largely augmenting the yield, and the later one less so, but

still remuneratively. The large amount of dressing required on the B plots is noticeable, the tops having been very large. These results show that both early and late applications pay well, increasing the crop and reducing disease, the earlier dressing being the better in both respects.

Experiments by the Royal Agricultural Society.

4. *Cheshire.—Lord Egerton of Tatton's Home Farm.*

Experiments in Cheshire.

Mr. J. T. Smith, Lord Egerton's agent, wished also to try, in some cases, the relative influences of *once* and *twice* dressing the

TABLE IV.—CHESHIRE.

Dressings per Acre.	Sound Tubers per Acre.	Diseased Tubers per Acre.	Percentage of Disease.	Increase of Crop, sound Tubers, per Acre.	Cost of Dressing per Acre.
ABUNDANCE.					
A 150 gals. July 8 -	T. c. q. lb. 10 14 0 24	T. c. q. lb. 1 5 0 0	Per cent. 10·45	T. c. q. lb. 2 9 3 4	*s. d.* 9 11
B 140 „ Aug. 26 -	9 18 0 16	0 18 2 24	8·61	1 13 2 24	9 7
C ——	8 4 1 20	1 2 3 12	12·20	—	—
BRUCE.					
A 120 gals. July 8 -	10 3 0 0	0 3 3 4	1·83	0 8 0 16 [decrease]	8 11
A2 {120 „ „ / 140 „ Aug. 26} -	9 19 1 20	0 1 3 12	·92	0 11 2 24 [decrease]	18 7
B 140 „ „ -	10 17 2 16	0 1 1 4	·58	0 6 2 0	9 8
C ——	10 11 0 16	0 2 2 8	1·10	—	—
MAIN CROP.					
A 110 gals. July 8 -	8 16 2 16	0 0 1 4	·16	0 3 0 8 [decrease]	8 8
A2 {110 „ „ / 140 „ Aug. 26} -	9 3 0 0	0 0 0 24	·11	0 3 1 4 [decrease]	18 3
B 140 „ „ -	8 5 1 12	0 0 1 12	·21	0 14 1 12	9 8
C ——	8 19 2 24	0 0 1 20	·23	—	—
IMPERATOR.					
A 130 gals. July 8 -	10 13 3 12	3 5 0 16	23·34	1 19 2 16 [decrease]	9 4
A2 {130 „ „ / 140 „ Aug. 26} -	11 6 2 24	2 16 0 0	19·80	1 6 3 4 [decrease]	19 0
B 140 „ „ -	13 4 0 0	1 7 2 24	9·50	0 18 2 0	9 8
C ——	12 13 2 0	1 19 1 4	13·41	—	—

Plot A, early application; B, late application; C, untreated.

Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

crop. Disease occurred to a certain extent in the Abundance and Imperator, but only very slightly in the Bruce and Main Crop. The potatoes were weighed October 5th and 6th.

Abundance.—Increase of crop, to a well-paying extent, resulted from both early and late applications, but the decrease of disease was less marked; the later dressing, however, was the more effectual in staying disease.

Bruce.—The influence of the dressings was here, in each case, to lessen the crop, nor was any result in lessening disease apparent.

Main Crop.—Here again, where disease was so slight, no preventive influence was shown from the dressings, and the crop was, in all cases but one, reduced slightly as well, the exception being with the plot twice dressed early, but where, however, the increase did not pay for the application.

Imperator.—Decrease of crop again was the result of the dressings, and there was even more disease on the early-treated plots than on the untreated plots. On the other hand, the late dressing seems to have lessened disease slightly and to have given a return that just paid for the application.

Use of dressing not satisfactory.

These results in Cheshire are somewhat anomalous, showing in one case (Imperator) an increase of disease from early dressing of the crop, and an increase of yield in the case of three varieties out of the four tried. The conclusion, therefore, is not satisfactory to the use of the dressing, be it early or late application, more especially the former. It was noted, however, that the soil varied considerably in texture on different parts of the field, and this not improbably had as much to do with the anomalous results as anything else.

5. *Devon.—Mr. Vosper's Farm.*

Experiments in Devon.

It had been intended to experiment on Early Puritan, but the crop had gone too far before the dressing could be put on, and so it was omitted. Unfortunately also, through Mr. Giles

TABLE V.—DEVON.

Dressings per Acre.	Sound Tubers per Acre.	Diseased Tubers per Acre.	Percentage of Disease.	Increase of Crop, sound Tubers, per Acre.	Cost of Dressing per Acre.
MAGNUM BONUM.					
A 125 gals. July 22 -	T. c. q. lb. 8 13 1 24	T. c. q. lb. 0 7 2 0	Per cent. 4·14	T. c. q. lb 2 3 1 24	*s. d.* 9 2
C ——	6 10 0 0	0 19 0 0	12·75	—	—
BRUCE.					
A 125 gals. July 22 -	9 14 3 4	0 3 1 4	1·65	1 12 3 4	9 2
C ——	8 2 0 0	0 16 0 0	8·98	—	—

Plot A, early application; C, untreated.

not being informed of the occurrence of disease, the B plots (late application) were not dressed. Consequently the trial was confined to the efficacy of the early applications. There was a moderate amount of disease in the crops made use of. With Magnum, disease was reduced from 12·75 per cent. to 4 per cent., and, concurrently, a large gain of crop was obtained. With Bruce, disease was lessened from 9 per cent. to 1·65 per cent., and a considerable increase of crop was yielded also.

Experiments by the Royal Agricultural Society.

These results were distinctly favourable to the use of the early application.

6. *South Wales.—Mr. Thomas Brown's Farm.*

Experiments in South Wales.

As already stated, the trial plots were in two cases free from any disease, and had therefore no bearing on the question of the efficacy of the bouillie bordelaise in preventing or in checking disease. A decrease of crop was the result in one instance.

Table VI.—Pembroke.

Dressings per Acre.	Sound Tubers per Acre.	Diseased Tubers per Acre.	Per-centage of Disease.	Increase of Sound Tubers per Acre.	Cost of Dressing per Acre.
BEAUTY OF HEBRON.					
	T. c. q. lb.	T. c. q. lb.	Per cent.	C. q. lb.	*s. d.*
A 100 gals. June 18	4 1 2 0	—	—	4 3 0 [decrease]	8 4
C ——	4 6 1 0	—	—		—
WHITE ELEPHANT.					
A 100 gals. July 4	2 9 0 0	—	—	0 13 4 [decrease]	8 4
C ——	2 9 3 14	—	—		—
IRISH FLOUNDER.					
A 100 gals. June 18	6 8 1 16	0 17 2 16	12	12 3 2	8 4
C ——	5 15 2 14	1 4 3 26	17·67	—	—

Plot A, early application; C, untreated.

Crops singularly small.

The crops were singularly small, less than 2½ tons per acre of the White Elephant being raised, and only 4 tons per acre of Beauty of Hebron. It would hardly be satisfactory to consider these results conclusive. A somewhat larger crop was shown with the Irish Flounder, and though there was some doubt as to the actual appearance of disease, it was found, on raising the crop, that from 12 to 17½ per cent. were bad, and that where the dressing had been used (plot A) a larger crop of sound tubers was obtained and a less proportion of bad ones.

Experiments in Great Britain.

Conclusions.

Putting together the results obtained from the different stations, excluding Cheshire, there is a unanimous verdict upon four points:—

Experiments by the Royal Agricultural Society.

Dressing checks disease.

1. That the dressing with bouillie bordelaise, though it does not entirely prevent disease, has a marked effect in lessening the extent to which disease spreads.

Crop increased.

2. That associated with the lessening of disease is an almost certain increase of crop, which more than pays for the cost of application of the dressing.

Early application best.

3. That the best treatment is an early application of the bouillie bordelaise before disease has made its appearance, and that this should be repeated if the marks of the first dressing have been removed by rain.

Late dressing checks spread of disease.

4. That, even if delayed until disease comes, a lessening of the spread of disease may to some degree be effected by a late dressing, and the crop, as a rule, will be sufficiently increased to pay for the application.

These results are borne out by four of the five stations at which the experiments were complete, those in Kent, Bedfordshire, Lincolnshire, and Devon exemplifying them almost in every particular, even with the many plots comprising the experiments at each spot. The results in Cheshire are the only ones that tell adversely to the utility of the dressing, and even here, in the case of one of the four crops, a large gain in yield was experienced.

General results of treatment favourable.

The general results may accordingly be stated as distinctly showing the advantage of using the bouillie bordelaise dressing, whether disease appears or not, and that the best plan is to apply the dressing about a fortnight before disease is likely to appear, and to renew it when washed off.

The foregoing Report on this year's experiments with bouillie bordelaise has been drawn up by Dr. Voelcker.

Mr. Carruther's experiment.

The following note is supplied by Mr. Carruthers on the experiments with potatoes conducted by him at Norwood:—

"The plot of ground on which the experiments were carried out had been in grass for many years; after it was trenched and well dunged, the potatoes were planted in the end of April. The seed tubers belonged to twelve varieties, and were planted in as many plots, each 16 feet by 8 feet, and containing 32 plants, so that every plant had 4 square feet to itself. There were consequently 384 seed potatoes planted, but of these seven failed to germinate.

The appearance of the plants above ground extended from May 19 to June 13. The earliest variety was the Early Regent, all the plants of it being visible by May 27. This was followed closely by the Magnum Bonum and the Abundance, and then the Bruce, the Holborn Prolific, and the Canon, all of which finished their germination within the fortnight. The Beauty of Hebron and the Holborn Reliance finished in the third week,

while the White Elephant, Carter's Surprise, Myatt's Ashleaf, and the Imperator extended into the fourth week.

Six of the potatoes were attacked shortly after germinating by a fungus which destroyed the tissues of the stem just above the ground, so that the leaves and the upper part of the stem fell to the earth and withered. The brown mycelium penetrated the cellular tissues, and spread itself over the surface of the stem at that part; portions of the stem were kept in a moist warm atmosphere, but although the mycelium continued to grow and spread over the glass, it produced no fructification, so that the species doing this injury could not be determined.

Experiments by the Royal Agricultural Society.

There was a vigorous growth of haulm above ground, but the soil in which they were planted, being stiff London clay, was very unfavourable for the proper development underground, and none of the tubers were fully ripened. No disease appeared in the plots. But, after the middle of August, some diseased haulms were spread among the potatoes. The only plot that was thereafter attacked by the fungus was Carter's Surprise. The leaves had already begun to lose their vigour, and the disease speedily completed the work of destruction, rendering it impossible to try the bouillie bordelaise. The plots which were still in vigorous growth were carefully watched, but no indications of disease were detected in the leaves above ground, nor in the potatoes when they were dug. It was proposed to treat the potatoes after they were attacked, and not to use the bouillie in these small plots as a preventive.

Careful observations were made twice daily of the temperature (maximum and minimum, wet and dry bulb), of the barometrical pressure, and of the rainfall, during the whole progress of the experiment. These observations had no importance, however, seeing that the disease did not appear in the plots."

(Signed) Charles Whitehead,
Chairman of the Seeds and
Plant Diseases Committee.

6th December 1892.

Experiments by the Royal Agricultural Society at Woburn on Prevention and Cure of "Potato-Disease."

Experiments at Woburn.

The Royal Agricultural Society, in addition to the experiments which it was conducting throughout the country on behalf of the Board of Agriculture, determined to institute others of its own, and the Woburn Sub-Committee drew up an extensive scheme for carrying out an inquiry at the Society's Experimental Farm at Woburn (Bedfordshire). The following report of the results of these experiments is reprinted from the Society's journal.

Experiments in Great Britain

Experiments by the Royal Agricultural Society.

The soil at the Woburn Farm is a light sandy loam, very suitable for potato growing. The field chosen was that known as Lansome Field, on a portion of which field experiments have been in progress for some years, but which is unfortunately not sufficiently uniform all over to make it a good field for close scientific experiment. As, however, these trials were rather for comparative purposes, namely, to test the efficacy of the bouillie bordelaise mixture in preventing or in checking the spread of potato-disease, the known slight inequalities of the land were not of such material consequence, and though they had appeared in the course of experiments requiring close accuracy, they were not more than would be found in any ordinary field selected as suitable for an experiment such as proposed.

Plan of Experiment.

Bouillie bordelaise and bouillie bordelaise sucrée used.

It is desirable here to note the points of difference between the present experiments and those conducted by the Society in other parts of the country. In the first place, the dressings employed comprised not only the ordinary bouillie bordelaise, made up of sulphate of copper, freshly-burnt lime, and water, but also the kind known as bouillie bordelaise sucrée, which contains molasses in addition to the other ingredients. This was tried, inasmuch as some laboratory experiments made in France by M. Girard pointed to the mixture containing sugar as being more efficacious than the ordinary bouillie, the syrup probably helping to retain the copper salt more firmly on the leaves and thus rendering it less likely to be removed by heavy rain. The ordinary bouillie used was made up with double the quantity of lime used in the Society's other experiments, this composition being, however, one of those freely recommended in France; it had the advantage, too, of making the comparison between the inclusion and the omission of molasses more definite. The dressings employed were, accordingly:—

Mixture I. Bouillie Bordelaise.

20 lb. sulphate of copper.
20 „ lime (unslaked).
100 gallons water.

Mixture II. Bouillie Bordelaise Sucrée.

20 lb. sulphate of copper.
20 „ lime (unslaked).
20 „ molasses.
100 gallons water.

In addition, trials were made of two other methods of treatment which have been advocated. The first was, to steep the "seed" potatoes in a solution of sulphate of copper before planting them, as is often done in the case of seed-wheat. The second was, to

steep the seed-potatoes for twenty-four hours in a solution made up as follows :— Experiments in Great Britain.

6 lb. sulphate of ammonia.
6 „ nitrate of potash.
25 gallons water.

Experiments by the Royal Agricultural Society.

A few small plots were devoted to these two-last-named experiments.

The general experiment with the bouillie bordelaise treatment was divided into two parts :—

(*a.*) A main experiment on three selected varieties of potato.

(*b.*) An experiment on a smaller scale with varieties specially susceptible to disease.

(*a.*) *The Main Experiment.*

Three well-known varieties of potato, representing respectively an "early," a "medium," and a "late" crop, were chosen. These were Beauty of Hebron ("early"), Scotch Regents ("medium"), and Champions ("late"). Three plots, each one-quarter acre in size, were devoted to each variety, as follows :— The main experiment.

Plot A for early application of the dressing (before disease appeared).

Plot B for late application of the dressing (on appearance of disease).

Plot C to be left untreated.

The quarter-acre plots were sub-divided, and while on one-half the ordinary bouillie bordelaise was to be applied, the other half was to be dressed with the bouillie bordelaise sucrée, the C plots in either case remaining undressed. The plots of the first half (ordinary bouillie) will, for convenience, be designated plots Aa, Ba, Ca.

(*b.*) *Experiment on Special Varieties.*

Smaller plots of $\frac{1}{16}$ acre each were set apart for trials with nine different varieties of potato which were believed to be specially liable to disease. Three plots, as before—one for early, one for late application of the dressing, and a third to be left untreated,—were marked out, the dressing consisting of the bouillie bordelaise sucrée. Special varieties.

The varieties selected were the following :—

Early kinds—Myatt's Ashleaf, Early Puritan, Early Rose.
Medium kinds—Dalmahoy, White Elephant, Reading Giant.
Late kinds—Imperator, Schoolmaster, Victoria.

The varieties chosen for the "steeping" experiment with sulphate of copper were Early Shaw and Village Blacksmith, and the same varieties also for the experiment with steeping in the sulphate of ammonia and nitrate of potash mixture. Each plot was $\frac{1}{32}$ acre in size.

Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

Preparation of dressings.

Preparation of the Bouillie Bordelaise Mixtures.

In the preparation of the bouillie bordelaise sucrée certain precautions had to be observed, these being set out in M. Perret's recipe for making it. The molasses must first be mixed with water, and the freshly slaked lime and water added to it with constant stirring. The sulphate of copper solution must be separately prepared, and then be added to the lime and sugar mixture, the whole being kept vigorously stirred. A decomposition then sets in, resulting in the sucrate of lime (formed by the bringing together of the sugar and the lime) changing into sulphate of lime, and the sulphate of copper into sucrate of copper. An intense blue colour is thus obtained, and the mixture settles down into a whitish-blue deposit which contains all the copper, and a clear liquid above. If the molasses be added first to the copper solution and the lime be added afterwards, a reduction of the copper sulphate occurs, resulting in the formation of a suboxide of copper, the mixture acquiring a yellow and finally a red colour.

Bouillie bordelaise sucrée should be used fresh.

The bouillie bordelaise sucrée should be always used when freshly prepared, as, after standing for some time, it is apt to turn to a dirty-green colour, owing to slight reaction taking place.

It may be well to note here that the vessels employed in making either of the bouillie mixtures should be of wood and not of metal, as the latter would be quickly eaten into holes by the mixture, the composition of which would become modified. At Woburn two wooden tubs holding 10 or 12 gallons each were found very suitable for preparing the lime and sulphate of copper solutions and a 40-gallon paraffin cask for making the mixture in. The actual amount made each time was $33\frac{1}{3}$ gallons. Twenty gallons of water were stirred up in the large cask with $6\frac{2}{3}$ lbs. of molasses; $6\frac{2}{3}$ lbs. of quicklime were put in one of the small wooden tubs with $6\frac{2}{3}$ gallons of water and allowed to cool down, after which the milk of lime was added little by little to the molasses and water, the whole being kept stirred. In a second wooden tub $6\frac{2}{3}$ lbs. of pounded sulphate of copper were dissolved in a little boiling water, and, when dissolved, cold water was added, making the whole up to $6\frac{2}{3}$ gallons. The latter solution was then added little by little to the milk of lime and molasses mixture in the large cask, stirring being kept up vigorously all the time. This gave a bright blue liquor, made up as follows:—

	Lbs.			Gallons.
Molasses	$6\frac{2}{3}$	-	with water	20
Lime	$6\frac{2}{3}$	-	„ „	$6\frac{2}{3}$
Sulphate of copper	$6\frac{2}{3}$	-	„ „	$6\frac{2}{3}$
	20			$33\frac{1}{3}$

this being the required strength of the bouillie bordelaise sucrée (Mixture II.).

In making up the ordinary bouillie bordelaise without sugar 6⅔ lbs. sulphate of copper were dissolved as before described, made up to 6⅔ gallons with cold water, and added little by little to 6⅔ lbs. of freshly-burnt lime slaked down with 26⅔ gallons of water and allowed to cool. This gave the necessary strength of the Mixture I. Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

In the steeping experiment with sulphate of copper, a solution of 2 per cent. strength sulphate of copper was used, and the whole tubers were immersed in it for 24 hours, then taken out and left to dry. In the other steeping experiment, whole tubers were put for 24 hours in a bath composed of 6 lbs. sulphate of ammonia, 5 lbs. nitrate of potash, and 25 gallons of water, after which they were taken out and left for another 24 hours to swell, being then planted whole. This latter method is said to have resulted in producing in France a crop of 42 tons per acre. Steeping experiment.

The sulphate of copper was tested before using, and was found to be pure, but considerable difficulty was experienced in getting good lime locally, so that, ultimately, burnt lime had to be obtained from Buxton.

Application of the Dressing.

Mr. Elliott, the Superintendent of the Woburn Experimental Farm, paid a good deal of attention to the best way of applying the dressings, the quantities required, and the permanence of the application, and he has furnished useful notes on the several points. His method of procedure was,—after having prepared the 33⅓ gallons of mixture in the 40-gallon cask, as mentioned in the last section—to put the cask on a cart and convey it to the potato field. The contents were stirred up (otherwise the deposit would settle down at the bottom) and baled out into the spraying machine. The machine used was the "Éclair" of M. Vermorel. This machine was found to work very effectually. Mr. Elliott thinks that a better plan than baling out the mixture would be to have a large wooden tap at the bottom of the cask and to fill the "Éclair" from it. He considers the work of applying the dressing rather heavy, the weight alone of the machine when full being considerable. A slight increase of the daily wage paid to the men was made, and this got over any difficulty. The man who applies the dressings should be provided with an old suit of clothes, as it is impossible to keep the spray away from the person using the machine. Application of dressing.

Particular instructions were given that the spraying should be done as thoroughly as possible on the *under side* of the leaf. As Mr. Carruthers, the Society's Consulting Botanist, has pointed out, it is on the *under side* of the leaf that the potato is attacked by the spores of the fungus (*phytophthora infestans*) settling on it and forcing its roots or *hyphæ*, as they are scientifically termed, into the *stomata* or openings which occur on the *under side* of the leaves, but far less numerously on the upper surface. On the upper surface, moreover, the leaf is provided with closely-set palisade cells which resist the entry of the *hyphæ* of the fungus, Under side of leaf sprayed.

Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

whereas these cells do not exist on the under side of the leaf. This view of the reasons that make it desirable to spray the under side especially is disputed by some practical men, including M. Vermorel himself, who maintains that effective spraying of the upper side of the leaves is ample, and that sufficient of the mixture finds its way below. But the botanical point involved is not questioned, and hence it seems sound reason and practice to guard the *lower* surface particularly, more especially as, in doing this, the operator cannot well fail to give a copious dressing to the upper surface at the same time. This, no doubt, involves the use of a larger quantity of the mixture, but it is the safer practice. With care it was found quite practicable to direct the nozzle of the machine under the leaves and, turning it upwards, to spray the under side of the leaves effectually.

Quantity of solution applied.

Mr. Elliott found that when the tops of the plant were still small, one man working with an "Éclair" could spray half-an-acre of potatoes per day, but that when the tops became larger, not above one-third of an acre a day could be done, and that when the tops grew very large it was impossible to spray each plant effectually without using a great amount of the dressing, as much as 200 gallons to the acre being occasionally required It was found in general that the quantity used varied from 100 gallons to 170 gallons per acre, according to the size of the tops. For a first dressing 100 gallons was enough, and for an average crop 120 gallons per acre might be taken as a fair quantity.

The weather best suited to the application was found to be a good drying day with moderate breeze; the dressing then dried on the leaves at once, and when this was the case it seemed to stick on them much longer than when put on upon a dull damp day. Mr. Elliott watched the dressed leaves carefully and noted that the effect of the spraying could be found on the under side of the leaves quite six weeks after its application, although all trace of it had been washed off the upper surface of the leaves.

Cost of Dressing.

Cost of dressing.

The raw materials were purchased as follows: Sulphate of copper (in half-cwt. lots in small wooden kegs), 18*s.* per cwt.; burnt lime (when purchased at a distance), 10*s.* per ton; molasses (purchased locally), about 1½*d.* per lb. A small addition must be made for carriage, but, taking it all round, it may be said that the general cost of the materials used in the two mixtures of bouillie were:—

	I. Bouillie Bordelaise.	II. Bouillie Bordelaise Sucrée.
	s. *d.*	*s.* *d.*
For 100 gallons per acre - - -	3 6	6 0
„ 120 „ „ - - -	4 2	7 2
„ 140 „ „ - - -	4 10	8 4

To the prices of materials must be added the cost of the actual application. This Mr. Elliott estimated at from 4*s.* to 6*s.* an acre. Taking 5*s.* an acre as the average, this would give the total cost of using the dressing:

Experiments by the Royal Agricultural Society.

	I. Bouillie Bordelaise.	II. Bouillie Bordelaise Sucrée.
	s. *d.*	*s.* *d.*
For 100 gallons per acre - - -	8 6	11 0
„ 120 „ „ - - -	9 2	12 2
„ 140 „ „ - - -	9 10	13 4

Sale of produce.

The last valuation necessary to make is that of the produce, which is very difficult to fix even approximately, as so much depends upon the state of the market. This year, indeed, owing to the small prevalence of disease, potatoes in Bedfordshire were almost a drug in the market, and very great difficulty was experienced in getting rid of them at almost any price. The price would vary also for each kind of potato. From 45*s.* to 90*s.* per ton (of 40 bushels) were the variations, and it could not be said that, as regards the really saleable potatoes, taking them all round, a higher price than 55*s.* a ton on the farm could be put. As to the others, a good number had to be sold as "cattle" or "pig" potatoes, and did not realise more than 25*s.* or 30*s.* a ton.

Planting.

Planting.

The field was ridged up well and dunged all over with about twenty loads of yard manure to the acre previous to the potatoes being put in; the tubers were set on the dung, and the ridges were split back. All the different varieties were set from April 15 to April 26, the early varieties first, and a nice steady rain succeeded the planting. The plants were bouted up June 10 to June 14. A severe frost on June 14 affected to some extent the young growth of the "earlies." On the plots (Early Shaw and Village Blacksmith) where the tubers had been steeped in sulphate of copper or in the solution of sulphate of ammonia and nitrate of potash, only a stray plant appeared, the dressings having evidently destroyed the vitality of the tubers, for, on the corresponding untreated plots of both varieties, the crop came up well.

Dates of Application of Dressing and Appearance of Disease.

Dates of application.

The first dressing with bouillie was done on 30th June, the earlier kinds having grown sufficiently by then; the other varieties were dressed for the first time on 6th and 7th July, and the whole was finished before any sign of disease appeared.

EXPERIMENTS IN GREAT BRITAIN.

Experiments by the Royal Agricultural Society.

The plants grew on, and by the middle of August the "early" kinds were quite ready to take up, but still no disease came, so these crops, viz., Beauty of Hebron, Myatt's Ashleaf, Early Rose, and Early Puritan, were raised 10th to 13th August, as also the Dalmahoy of the "medium" varieties on 16th August. There were no diseased tubers in either of these crops. On 24th August it was noticed that the dressing had for the most part been washed off the leaves of the remaining plots, and directions were given that the plants should be again sprayed. This was begun on 1st September, and the very same day (and before the spraying could be completed) disease began to make its appearance. Mr. Carruthers's examination of some of the leaves sent to him confirmed the presence of the fungus (*phytophthora infestans*). The varieties most affected appeared to be Schoolmaster, Victoria, and White Elephant. Thereupon not only were the previously dressed A plots (for early application) sprayed once more, but the B plots (for late application) were also treated. By 9th September all the A and B plots had been dressed. Bearing in mind that the A plots were those dressed early, before disease appeared, that the B plots were dressed late, on the appearance of disease, and that the C plots remained untreated throughout, the following notes, taken on 3rd September, may be given :—

Appearance of disease.

White Elephant -	A hardly attacked at all. B very badly diseased. C very badly diseased.

Here a marked difference was seen between the A plot and the others.

Reading Giant -	A and B hardly touched. C one large patch in centre of plot diseased.
Imperator - -	A and C leaves slightly spotted. B rather more attacked.
Schoolmaster - -	All plots slightly attacked; A less than the others.
Victoria - -	All plots slightly attacked; A less than the others.
Regent - -	All plots slightly spotted; no difference between them.
Champion - -	Hardly attacked at all; only a few spots here and there; no difference between the plots.

Condition of plots.

Thus it will be seen that, while the A plots were, generally speaking, rather less attacked than the B and C plots, there was only one instance, the White Elephant, where there was a marked difference in favour of the A's. This, however, it should be noted, was where disease was most prevalent. After 3rd September the disease became much worse on all the plots. As the

crop approached ripeness, a considerable difference was noted between the tops which had been sprayed (A and B) and those which had not been dressed. The tops of the sprayed plots remained green long after the haulms on the C plots had died down. All the remaining crops were dug and weighed 11th to 25th October.

Notes on the Varieties.

Notes on varieties.

The following notes were taken by Mr. Elliott upon the relative qualities of the different varieties :—

Beauty of Hebron	Good early cropper; clean skin; shallow eye; very saleable.
Myatt's Ashleaf	An early kidney potato; small cropper and hardly a field variety; the skin becomes scabby on the Woburn land.
Early Puritan	Early and fair cropper, but runs rather small.
Early Rose	Early, but not very saleable, as it is very apt to grow pink right through the tuber.
Dalmahoy	Medium early; good cropper; not a coarse skin, but rather scabby.
Regent	Coarse-skinned; deep-eyed; very unsaleable.
White Elephant	Good cropper (although liable to disease); cooks well; saleable, but does not keep well.
Reading Giant	Good-looking potato; very heavy cropper, clean thin skin; saleable.
Champion	Coarse cattle potato; deep-eyed; goes hollow in centre and becomes rotten there; almost unsaleable.
Imperator	Very good cropper; clean skin; plant has very large tops; quite saleable.
Schoolmaster	Very fair cropper, but scabby, and not a saleable potato.
Victoria	Average cropper; good cooker; apt to grow out of ground instead of pushing downwards.

From these notes, and the crop weights that follow, it will be gathered that the best potato among the "earlies" was the Beauty of Hebron, among the "medium" crops the Reading Giant, and of the "late" varieties the Imperator.

The potatoes when dug were divided into sound and diseased tubers, which were weighed separately. The weights per acre of the respective varieties are given in the accompanying tables, which also show the influence of the early and late applications of the bouillie dressing.

Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

Steeping tubers quite unsuccessful.

Before proceeding to discuss the tables, the experiments in steeping the tubers before planting may be dismissed briefly by saying that they were quite unsuccessful. With regard to steeping in sulphate of copper, it was pretty well known to the scientific officers of the Society that it would most probably result in destroying the vitality of the tubers, but the trial was made in consequence of a suggestion that if steeping seed-wheat in sulphate of copper prevented "smut," the disease in the potato-crop might be similarly prevented. But the two cases are by no means analogous, for, with the wheat, the fungus is associated with unhealthy seed, and is on the exterior of the seed, subsequently penetrating into it; whereas the fungus of potato-disease arises from sources *external* to the plant and may be carried to the leaves of perfectly healthy plants. Again, while the germ of the wheat is protected by the hard casing of the seed, the potato tuber has only a delicate skin which is not sufficient to prevent the known destructive action possessed by a solution of sulphate of copper.

The steeping in a solution of sulphate of ammonia and nitrate of potash similarly destroyed the vitality, and fell very far short of producing the stated 42 tons per acre.

In connection with these steeping experiments it is well to mention that in a trial on potatoes carried out at Lord Egerton of Tatton's Home Farm, these two same methods were employed, and with precisely similar results to those obtained at Woburn.

The Results.

Results of dressings on disease.

It now remains to discuss the results of the weighings, with a view of ascertaining the following principal points:—

1. Whether the application of the bouillie had a *preventive* effect.

2. Whether the application had a *curative* effect when disease had once appeared.

3. Whether the mixture *with* sugar or that *without* sugar was the more effectual.

4. Whether the application of the dressings had any influence in increasing or diminishing the produce.

5. Whether, on the whole, it *paid* to use either dressing.

It is advisable to consider the cases in which no disease whatever occurred separately from the others. These cases include all the "early" varieties, and one "medium" variety (Dalmahoy). In these the influence of the dressings in preventing or checking disease is of course not apparent, and, generally speaking, it may be said of "early" potatoes that they are, as a rule, out of the ground before disease appears. It remains only, therefore, to follow the influence on the yield.

Series 1. Beauty of Hebron.—It is very clear from the figures that the part of the field where the plots 1 A, 1 B dressed with the bouillie bordelaise sucrée occurred (for they were together at at one end and the comparative ones dressed with the ordinary

bouillie without sugar were at the other end) is poorer than the end where plots 1 Aa, 1 Ba were. The addition of sugar to the mixture showed no gain as compared with its omission. The dressing in each case showed a decrease of crop, the greater decrease being when the early application was used.

Experiments in Great Britain.

Experiments by the Royal Agricultural Society.

Series 4. *Myatt's Ashleaf.*—A gain of crop was obtained by the early dressing, but not quite enough to pay for the application. With the late dressing there was a slight loss.

Series 5. *Early Puritan.*—Here there was a distinctly paying gain, more especially from the early application.

Series 6. *Early Rose.*—The result was similar to the last, but the gain was a much-increased one.

Series 7. *Dalmahoy.*—Again a very large increase of crop, and, as before, more marked with the earlier application.

On the whole, therefore, there is a gain of crop with four varieties out of five, the result being a paying one in three cases, while in a fourth the cost is just about met. With one variety only (Beauty of Hebron) was there a decrease.

The general result of the dressing, even when disease has not appeared, is favourable to the adoption of the remedy, and goes to show that the early application is decidedly the more beneficial, while the addition of sugar to the mixture would not appear to be an advantage, but only an increased expense.

General result favourable, early application more beneficial.

Taking next the cases where disease appeared:—

Series 2. *Regent.*—There was a considerable amount of disease here. The application, whether of the ordinary bouillie bordelaise or of the same with sugar, had a marked influence in decreasing disease. Nevertheless, it did not succeed in preventing it altogether. When dressed early, disease was lessened in the one case by 10 per cent. and in the other by 7 per cent. The addition of sugar proved of no advantage in lessening disease, but (somewhat inconsistently, it must be said) the crop was largely increased, and paid excellently for the application. The heaviest crop, however, was not more than when no sugar was used.

Series 8. *White Elephant.*—Here again was a good deal of disease. The early application of the mixture decreased disease very largely, though it did not prevent its appearance; the reduction was one from 26 per cent. down to 8 per cent. The late application was of only slight benefit, and evidently did not "cure" the disease when once it had appeared. As to the weight of crop, a slight decrease was shown with the earlier dressing, and a considerable one with the later.

Series 9. *Reading Giant.*—This was a remarkably heavy crop, the heaviest of all the series, amounting in each plot to over 15 tons per acre. Disease was very slight, and there was a small increase of crop when either dressing was applied, which just paid for the cost.

TABLE I.—*Early Crops.*

Variety.	Plot.	Weight per Acre of Sound Tubers.	Weight per Acre of Diseased Tubers.	Per cent. of Diseased Tubers.	Increase of Crop per Acre.	Decrease of Crop per Acre.	Per-centage of Increase in Crop.	Per-centage of Decrease in Crop.	Cost of Dressing per Acre.	Value of Gain or Loss in Crop per Acre by the dressing.	Nett Profit or Loss per Acre by the dressing.
		T. c. q. lb.	T. c. q. lb.	Per cent.	T. c. q. lb.	T. c. q. lb.	Per cent.	Per cent.	*s. d.*	*s. d.*	*s. d.*
Beauty of Hebron -	1 Aa	6 11 1 20	None	None	—	1 13 0 14	—	20·13	18 4	− 91 0	− 109 4
„ „ -	1 Ba	8 0 0 0	„	„	—	0 4 2 6	—	2·76	9 2	− 12 4	− 21 6
„ „ -	1 Ca	8 4 2 6	„	„	—	—	—	—	—	—	—
„ „ -	1 A	5 16 0 0	„	„	—	1 8 1 20	—	19·68	24 4	− 78 4	− 102 8
„ „ -	1 B	6 1 0 8	„	„	—	1 3 1 12	—	16·17	12 2	− 63 11	− 76 1
„ „ -	1 C	7 4 1 20	„	„	—	—	—	—	—	—	—
Myatt's Ashleaf - -	4 A	5 8 3 12	„	„	0 7 2 24	—	7·62	—	24 4	+ 20 7	− 3 9
„ „ -	4 B	5 0 1 4	„	„	—	0 0 3 12	—	·84	12 2	− 2 0	− 14 2
„ „ -	4 C	5 1 0 16	„	„	—	—	—	—	—	—	—
Early Puritan - -	5 A	6 17 1 4	„	„	1 3 0 0	—	20·12	—	24 2	+ 63 3	+ 39 1
„ „ -	5 B	6 5 0 0	„	„	0 10 2 24	—	9·37	—	12 2	+ 28 10	+ 16 8
„ „ -	5 C	5 14 1 4	„	„	—	—	—	—	—	—	—
Early Rose - -	6 A	6 16 2 8	„	„	1 12 3 12	—	31·68	—	24 2	+ 90 0	+ 65 10
„ - -	6 B	6 5 0 0	„	„	1 1 1 4	—	20·52	—	12 2	+ 58 5	+ 46 3
„ - -	6 C	5 3 2 24	„	„	—	—	—	—	—	—	—
Dalmahoy - -	7 A	9 7 0 0	„	„	1 16 0 16	—	23·95	—	24 2	+ 99 0	+ 74 10
„ - -	7 B	8 6 2 8	„	„	0 15 2 24	—	10·41	—	12 2	+ 42 7	+ 30 5
„ - -	7 C	7 10 3 12	„	„	—	—	—	—	—	—	—

Plots A dressed twice, before disease appeared, with bouillie bordelaise sucrée.
Plots B dressed once, upon appearance of disease, with bouillie bordelaise sucrée.
Plots C left untreated.

Plots Aa, Ba, dressed with the ordinary bouillie bordelaise without sugar.
Plots Ca, left untreated, to compare with Aa and Ba.

TABLE II.—*Medium Crops.*

Variety.	Plot.	Weight per Acre of Sound Tubers.	Weight per Acre of Diseased Tubers.	Per cent. of Diseased Tubers.	Increase of Crop per Acre.	Decrease of Crop per Acre.	Per-centage of Increase in Crop.	Per-centage of Decrease in Crop.	Cost of Dressing per Acre.	Value of Gain or Loss in Crop per Acre by the dressing.	Nett Profit or Loss per Acre by the dressing.
		T. c. q. lb.	T. c. q. lb.	Per cent.	T. c. q. lb.	T. c. q. lb.	Per cent.	Per cent.	*s. d.*	*s. d.*	*s. d.*
Scotch Regent -	2 Aa	9 16 2 8	0 13 0 0	6·23	—	0 15 2 24	—	7·40	18 4	– 43 3	– 61 7
„ „ - -	2 Ba	9 12 0 0	0 19 12 16	9·28	—	1 0 1 4	—	9·59	9 2	– 55 8	– 64 10
„ „ - -	2 Ca	10 12 1 4	2 1 0 0	16·18	—	—	—	—	—	—	—
„ „ - -	2 A	9 3 2 24	0 17 1 4	8·59	2 1 2 8	—	29·24	—	24 4	+ 114 1	+ 89 9
„ „ - -	2 B	8 3 2 0	1 6 1 4	13·85	1 1 1 12	—	15·02	—	12 2	+ 58 5	+ 46 3
„ „ - -	2 C	7 2 0 16	1 6 1 4	15·60	—	—	—	—	—	—	—
White Elephant -	8 A	9 12 2 8	0 17 1 20	8·29	—	0 5 0 0	—	2·53	24 2	– 13 9	– 37 11
„ „ - -	8 B	9 8 0 0	2 16 0 0	25·00	—	1 9 2 8	—	14·92	12 2	– 81 1	– 93 3
„ „ - -	8 C	9 17 2 8	3 12 0 0	26·70	—	—	—	—	—	—	—
Reading Giant -	9 A	15 11 1 20	0 5 0 0	1·56	0 8 3 12	—	2·92	—	24 2	+ 24 0	– 0 2
„ „ - -	9 B	15 8 3 12	0 2 2 8	·82	0 6 1 4	—	2·07	—	12 2	+ 17 2	+ 5 0
„ „ -	9 C	15 2 2 8	0 6 0 24	2·01	—	—	—	—	—	—	—

Plots A dressed twice, before disease appeared, with bouillie bordelaise sucrée.
Plots B dressed once, upon appearance of disease, with bouillie bordelaise sucrée.
Plots C left untreated.

Plots Aa, Ba, dressed with the ordinary bouillie bordelaise without sugar.
Plots Ca, left untreated, to compare with Aa and Ba.

TABLE III.—*Late Crops.*

Variety.	Plot.	Weight per Acre of Sound Tubers.	Weight per Acre of Diseased Tubers.	Per cent. of Diseased Tubers.	Increase of Crop per Acre.	Decrease of Crop per Acre.	Per-centage of Increase in Crop.	Per-centage of Decrease in Crop.	Cost of Dressing per Acre.	Value of Gain or Loss in Crop per Acre by the dressing.	Nett Profit or Loss per Acre by the dressing.
		T. c. q. lb.	T. c. q. lb.	Per cent.	T. c. q. lb.	T. c. q. lb.	Per cent.	Per cent.	*s.* *d.*	*s.* *d.*	*s.* *d.*
Champion	3 Aa	12 19 2 8	0 2 0 16	·81	—	1 2 3 12	—	8·09	18 4	− 62 6	− 80 10
,,	3 Ba	14 11 0 8	0 2 0 24	·75	0 8 12 16	—	3·94	—	9 2	+ 23 4	+ 14 2
,,	3 Ca	14 2 1 20	0 2 1 20	·85	—	—	—	—	—	—	—
,,	3 A	10 14 0 3	0 2 2 0	1·15	—	1 12 3 12	—	13·31	24 4	− 90 0	− 114 4
,,	3 B	11 19 0 0	0 1 1 12	·80	—	0 7 3 12	—	3·18	12 2	− 21 3	− 33 5
,,	3 C	12 6 3 12	0 2 2 8	1·03	—	—	—	—	—	—	—
Imperator	10 A	13 0 1 4	0 10 2 24	3·95	0 14 2 8	—	5·93	—	24 2	+ 39 10	+ 15 8
,,	10 B	13 5 2 8	0 7 2 24	2,82	0 19 3 12	—	8·08	—	12 2	+ 54 3	+ 42 1
,,	10 C	12 5 2 24	0 7 2 8	2·98	—	—	—	—	—	—	—
Schoolmaster	11 A	8 12 2 8	0 2 0 16	1·22	—	2 0 1 4	—	18·92	24 2	− 110 8	− 134 10
,,	11 B	9 13 0 0	0 5 0 16	2·59	—	0 19 3 12	—	9·32	12 2	− 54 3	− 66 5
,,	11 C	10 12 3 12	0 6 0 16	2·81	—	—	—	—	—	—	—
Victoria	12 A	10 2 0 0	0 5 1 20	2·61	2 17 0 16	—	39·44	—	24 2	+ 156 9	+ 132 7
,,	12 B	8 14 2 8	0 14 1 20	7·63	1 9 2 24	—	20·51	—	12 2	+ 81 1	+ 69 1
,,	12 C	7 4 3 12	0 15 2 8	9·70	—	—	—	—	—	—	—

Plots A dressed twice, before disease appeared, with bouillie bordelaise sucrée.
Plots B dressed once, upon appearance of disease, with bouillie bordelaise sucrée.
Plots C left untreated.

Plots Aa, Ba, dressed with the ordinary bouillie bordelaise without sugar.
Plots Ca, left untreated to compare with Aa and Ba.

The foregoing comprise the "medium" varieties. Coming next to the "late" varieties:— Experiment in Great Britain.

Series 3. *Champion.*—There was hardly any disease at all, but the dressings, except in one case, lessened the crop. The sugar admixture was not more beneficial than the other. Experiments by the Royal Agricultural Society.

Series 10. *Imperator.*—Disease occurred, but only to a small extent. The dressings did not lessen disease, but in each case increased the crop well above the cost incurred. The balance was in favour of the later application.

Series 11. *Schoolmaster.*—There was only a little disease, which was slightly lessened by the early application. The crop was, however, decidedly heavier on the untreated plot.

Series 12. *Victoria.*—Here disease occurred, and the dressings succeeded in lessening it, more especially the early dressing, there being only 2·6 per cent. of disease, as against 9·7 per cent. on the untreated plot. The crop also showed a remarkable increase where the dressings were put on, the early one being very successful indeed.

With the "medium" and "late crops" it would appear that the dressings, though successful in reducing the amount of disease wherever it occurred to any marked extent (viz., in Regent, White Elephant, and Victoria), did not in any case prevent it altogether. The early application was decidedly more successful than the later one. There was no case in which the sugar admixture was more efficacious than that without it. As to gain or loss of crop, out of seven cases, there are three of loss and three of gain, while in the seventh (Regent) gains and losses are balanced. There is only one clear case in which the late dressing has done any *marked* good. With medium and late crops dressing did not prevent disease altogether.

Taking all the varieties, "early," "medium," and "late," together, there are, as the result of the dressings, good paying gains of produce in five cases out of twelve, as against four cases of loss, and three cases where gains and losses about balanced. Further, out of seven cases in which disease occurred, the dressings succeeded in five instances in reducing the amount of disease, while in no case was it increased.

Conclusions.

To sum up these results, the following conclusions may be drawn:— Conclusions.

1. That neither the ordinary bouillie bordelaise, nor the bouillie bordelaise sucrée, had an entirely *preventive* effect, though both of them, when applied early and before disease appeared, succeeded in lessening the extent to which disease proceeded. Dressings not entirely preventive.

2. That neither dressing when applied after disease appeared had any material effect in *curing* the disease. Do not cure disease.

Experiments in Great Britain.

3. That the addition of sugar to the ordinary bouillie bordelaise did not constitute any advantage, but only added to the expense.

Experiments by the Royal Agricultural Society,

4. That the effect of either dressing upon the weight of produce was uncertain, but tended in the majority of cases to increase rather than to diminish the crop.

Early application recommended.

5. That, in view of the lessening of disease, and the increase, in the majority of cases, of the crop, the early application of the ordinary bouillie bordelaise is to be recommended as a remunerative one.

It must be borne in mind that the past season was one in which disease was not by any means prevalent, and that disease appeared very late in the year. Seeing that the early dressing was most effectual where disease occurred the most, it is a fair deduction that in a season when disease showed itself badly the dressing would give even more favourable results than those now set forth.

(Signed) J. Augustus Voelcker.

Experiments by the Technical Education Committee of the Wilts County Council.

Experiments by Wilts County Council.

In 1892 some experiments with potato dressings were carried out by the Technical Education Committee of the Wilts County Council at Warminster, Horningsham, and Heytesbury, and the following summary of the results of these experiments has been compiled from the Report of the Committee which was published early in 1893.

In the report of the Hon. Secretary to the Experiment Sub-Committee it is stated that in addition to the dressings applied on the experimental plots, it was thought desirable, in order to secure a greater range of varieties and situations, and also to secure results on larger areas, to apply the dressings on other and, in some cases, larger plots than those of the experimental stations. Eight plots of potatoes were therefore selected for trial in the neighbourhood, whose owners were willing to apply the dressing, and which were apparently suitable in respect of situation and uniformity. In all cases, both on the experimental plots and on the eight plots above mentioned, equal areas were left undressed adjoining those which were dressed.

Perret's modification of bouillie bordelaise used.

The dressing used was that known as Perret's modification of the original "Bouillie Bordelaise," and was made in the proportion of 2 lbs. each sulphate of copper, lime, and molasses, to 10 gallons of water. It was distributed from a Vermorel's "Éclair" spraying machine, which is carried as a knapsack, and holds three gallons.

Experiments at Warminster.

At Warminster the first dressing of the sucrated copper and lime mixture was applied on July 21st during fine weather, which

Experiments by Wilts County Council.

continued for a fortnight afterwards. The quantity used was about one gallon per perch = 160 gallons per acre. The earlier varieties had just commenced to wither off. No disease was to be found on the haulm of any of the plots or in the immediate neighbourhood at this time, and none appeared for about three weeks, during the whole of which time the blue deposit of the mixture remained apparent on the foliage. A second dressing was applied to the later varieties, plots 1 to 12 (except 3) on August 16th, the same quantity of the mixture being used. At this time the earlier varieties, Beauty of Hebron and Webber's Early Beauty, had ripened off without showing any signs of disease in the haulm. The later-planted Beauty of Hebrons, however, were still green, whilst the undressed portions had taken the disease badly. A few spots were also to be seen on the undressed portions of the other later plots, and within a few days these commenced rapidly to decay, whilst the dressed areas remained green for a month longer until cut off by the frost. The varieties which held out longest in full growth were Imperators, Main Crop, Bruce, and Reading Giant.

On the plots other than the experimental stations, to which dressings were applied there was the same prolonged growth after the undressed areas had decayed, continuing in the case of all the later varieties until the frost of September 17th.

The crop was raised between October 3rd and 10th in dry weather, except plot 10, Imperators, which, being still green, were left. These were finally cut down by the frost about October 18th, but constant rain prevented digging before November 7th.

The produce of each plot was placed in a separate bag at the time of digging and labelled. They were afterwards weighed, and the weights checked by two members of the Committee.

Experiments at Horningsham.

At Horningsham the first dressing of the copper solution was applied on July 20th. Disease had not generally appeared in the district at this time, nor did it do so until nearly a month later, but a patch of potatoes in a garden adjoining the experimental plots was at this time considerably spotted with disease in one corner, where it was stated that refuse was generally thrown. On the experimental plot nearest this garden one or two spots of disease were noticed when the first dressing was applied. The haulm on all the plots was then over 3 feet in height, and most luxuriant in growth; so much so that some difficulty was experienced in getting between the ranks to apply the dressing.

The second dressing was applied on August 17th. At this time disease had appeared generally at Horningsham, and had attacked the whole of the undressed area of the plots. Within a week after this the haulm on these parts of the plots had almost completely decayed. The dressed area remained green, with only a few spots of disease, for a month or five weeks afterwards.

The frosts which are referred to in connection with the Warminster experiments did not affect the Horningsham plots.

EXPERIMENTS IN GREAT BRITAIN.

Experiments by Wilts County Council.

Experiments at Heytesbury.

The crop was raised in fine weather on October 10th to 12th, and weighed on the ground.

In the experiments at Heytesbury a dressing of the copper solution was applied on July 21st. No trace of disease was at this time apparent, and none appeared in the immediate locality for more than five weeks afterwards, by which time the whole of the plots had withered off. Notwithstanding that no disease appeared, the dressed portions of the plots remained green somewhat longer than the remainder, and it will be seen that they yielded a heavier crop. Some allowance, however, must be made for the effects of frost on the outside rows which formed part of the undressed area.

The crop was raised in fine weather, on September 24th and 26th. As was anticipated the quantity of diseased tubers was very small.

On certain of the areas dressed the ordinary bouillie bordelaise (2 lbs. sulphate of copper and 1 lb. lime in 10 gallons) was used side by side with the Perret solution.

The seed of some of the potatoes experimented with was soaked for 24 hours in sulphate of ammonia and nitrate of soda before planting. In some cases the seed was killed and did not germinate. In three cases where germination took place there was no comparative gain from the soaking.

Results.

The results of the experiments are shown in the tables which follow : —

A.—WARMINSTER. 12 perches, different varieties, all adjoining, 6 perches dressed twice, July 20th and August 16th, and 6 perches left undressed in such manner as to divide each plot.

Plot.	Variety.	Not Dressed.		Dressed.			Gain of Sound Tubers per acre.		Gain of Sound Tubers per cent.
		Sound.	Diseased.	Sound.	Diseased.	Equal to per acre Sound Tubers.			
		Lbs.	Lbs.	Lbs.	Lbs.	Ton. Cwt.	Ton.	Cwt.	
11.	White Elephant	65	28½	105½	3½	15 2	5	16	62½
5.	Reading Giant	100½	6½	135½	3	19 6	5	0	35
8.	White Elephant (Soaked Seed).	67½	23	90½	6	12 19	3	6	34
7.	Main Crop (Soaked Seed).	108½	2	141½	—	20 4	4	14	30½
1.	Schoolmaster	67	22	85	3½	12 3	2	11	27
12.	Bruce	107½	2½	132	½	18 17	3	9	22½
10.	Imperator	177½	6½	208½	1½	29 17	4	10	17½
9.	Bruce (Soaked Seed)	109	1½	121½	½	17 6	1	14½	11
4.	Main Crop	119½	2	130½	—	18 13	1	11½	9
3.	Webber's Early Beauty	72½	7	78	2½	11 3		15	7
2.	Magnum Bonum	93½	1½	99½	2	14 4½		16½ (loss)	(loss)
6.	Reading Russet	86	18½	79½	7	11 8		18	7
		1,174½	121½	1,407½	29½	16 15	2	15	19·6

Experiments by Wilts County Council.

B.—WARMINSTER. 2 perches late planted, 1 perch dressed, 1 perch not dressed.

Plots.	Variety.	Not Dressed.		Dressed.			Gain at per acre.	Gain per cent.
		Sound.	Diseased.	Sound.	Diseased.	Equal to per acre Sound Tubers.		
		Lbs.	Lbs.	Lbs.	Lbs.	Ton. Cwt.	Ton. Cwt.	
19, 20.	Beauty of Hebron -	93½	54	128½	11½	9 3½	2 10	37·4

C.—HORNINGSHAM. 20 perches, Reading Giant.

Not Dressed, 10 Perches.		Dressed, 10 Perches.				Gain of Sound Tubers at per acre.		Gain of Sound Tubers, per cent.
Sound.	Diseased.	Sound.	Diseased.	Equal to per acre, Sound Tubers.				
Lbs.	Lbs.	Lbs.	Lbs.	Ton.	Cwt.	Ton.	Cwt.	
2,147½	150	2,531½	78	18	1½	2	15	17·9

D.—Plots other than the Experimental Plots to which Dressing were applied.

Results of other experiments.

Owner.	Variety.	Not Dressed.			Dressed.		
		Perches.	Sound.	Diseased.	Perches.	Sound.	Diseased.
			Lbs.	Lbs.		Lbs.	Lbs.
Mr. G. Trollope -	Magnum Bonum -	16	2,688	140	16	3,612	20
Mr. F. Shepherd -	Magnum Bonum -	16	2,699	19	16	2,961	1
Mr. H. J. Wakeman	Magnum Bonum -	3	570	22	3	708	½
Mr. J. W. Atkins -	Daniell - -	7½	1,290	222	7½	1,145	67
Mr. E. S. Beaven -	Bruce - -	2½	705	31	2½	356	6
„ „ -	Imperator - -	2½	430	21	2½	493	4
Mr. F. J. N. Glass -	Reading Giant -	2½	486	33	2½	566	8
Mr. J. Smith -	Reading Russet -	1	110	14	1	135	17
		51	8,518	532	51	10,276	123
						8,518	

Gain from Dressing 51 perches - - 1,758 lbs.

Equal to 2 tons, 9 cwts. per acre, or 20·6 per cent.

EXPERIMENTS IN GREAT BRITAIN.

Experiments by Wilts County Council.

SUMMARY.

	No. of Perches.	Not Dressed. Sound.	Diseased.	Equal to per acre Sound Tubers.	No. of Perches.	Dressed. Sound.	Diseased.	Equal to per acre Sound Tubers.	Gain per acre.	Gain per cent.
		Lbs.	Lbs.	Ton. Cwt.		Lbs.	Lbs.	Ton. Cwt.	Ton. Cwt.	
A	6	1,174½	121½	14 0	6	1,407½	29½	16 15	2 15	19·6
B	1	93½	54	6 13½	1	128½	11½	9 3½	2 10	37·4
C	10	2,147½	150	15 6½	10	2,531½	78	18 1½	2 15	17·9
D	51	8,518	532	11 18½	51	10,276	121½	14 8	2 9½	20·6
Total	68	11,933½	857½	12 10½	68	14,343½	240½	15 1½	2 11	20·1

NOTE.—On all the above areas disease appeared in the haulm either on the undressed only, or on both the undressed and the dressed portions.

WARMINSTER. 10 perches, Beauty of Hebron. Early planted Plots, 13 to 18, and 21 to 24.

	Not Dressed (5 Perches).				Dressed (5 Perches).			
	Sound.		Diseased.		Sound.		Diseased.	
	Lbs. 76¾		Lbs. 79		Lbs. 753¾		Lbs. 40¾	
	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.
Equal to per acre	10	18	1	2½	10	15	0	11½

HEYTESBURY. 17 perches, White Elephant.

	Not Dressed (7 Perches).				Dressed (10 perches).			
	Sound.		Diseased.		Sound.		Diseased.	
	Lbs. 644		Lbs. 11		Lbs. 1,171		Lbs. 4¼	
	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.
Equal to per acre	6	11	0	2	8	7	0	0½

NOTE.—On the Heytesbury plots the undressed portions were more affected by frost than the dressed portions.

The above results show that the average gain in sound potatoes on the entire area dressed was at the rate of 2 tons 11 cwts. per acre, leaving out of account those areas where no disease appeared in the haulm. In some cases the gain was at the rate of as much as 5 tons per acre.

Experiments by Wilts County Council.

In all cases where an increased crop of sound tubers followed from the dressing, there was a prolonged growth of the haulm, evidently due to the protection afforded by the copper solution, and the growth of the tubers in size corresponded to the increased growth of haulm. In most cases the haulm of the dressed areas was green from three to five weeks after that of the undressed areas had completely succumbed to the disease and rotted away. This prolonged growth would have lasted even longer if it had not been for a very early frost on the night of September 17th, when 8 degrees below freezing point was registered at Warminster.

On the dressed half of plot 10 at Warminster the Imperators were green and growing on October 13th, more than five weeks after the haulm of all the undressed potatoes in the neighbourhood had decayed.

Further experiments necessary to determine quantity and strength of solution.

It is remarked that further experiments are necessary to determine the quantity and strength of the solution required to give the best results. In these experiments, the quantity used was from 150 to 200 gallons per acre (about 1 to $1\frac{1}{4}$ gallons per perch) at each application. In all cases, 2 lbs. of copper sulphate were used to each 10 gallons of mixture.

Experiments by the Kent County Council.

Experiments by the Kent County Council.

In 1892 some experiments with Boullie Bordelaise to prevent potato disease were carried out by an Experiments Committee appointed by the Horticultural College, Swanley, under the sanction of the Kent County Council.

The experiments were made at the Horticultural College, Swanley, on four equal-sized plots of potatoes planted as shown on the subjoined plan, each containing one-fifth of an acre, and planted with five varieties, viz., The General, Beauty of Hebron, Magnum Bonum, Snowflake, and Dunbar Regents.

The liquid for spraying was a 2 per cent. solution, consisting of 4 lbs. sulphate of copper, 4 lbs. quicklime, to 20 gallons of water.

Plot 1 was dressed three times (on 27th June, 14th July, and 1st August). The first two applications were made to the whole surface of the foliage, and the third to the under side of the leaves.

Plot 2 was dressed once only (on 18th July), 4 lbs. of molasses being added to the above solution to cause the copper to adhere better to the leaves.

EXPERIMENTS IN GREAT BRITAIN.

Experiments by the Kent County Council.

Plot 3 was not treated, and served as a control plot for the experiments.

Plot 4 was dressed once, on July 18th.

	1.	2.	3.	4.
65 feet.	45 ft. VARIETY.—The General. MANURE. — Farm yard. PLANTING. —Dibbled.	45 ft.	45 ft.	45 ft.
33	VARIETY.—Beauty of Hebron. 3 rows + Nitrate of soda; rate, 2 cwt. per acre. 3 rows + Kainit; rate, 3 cwt. per acre. MANURE.—Farm yard. PLANTING.—Dibbled.			
12	Magnum Bonum.—Farm yard.—Baulked.			
34	VARIETY.—Snowflake. MANURE.—Farm yard. PLANTING. —Baulked.			
35	VARIETY.—Snowflake. MANURE.—Farm yard. PLANTING. —Dibbled.			
26	VARIETY.—Dunbar Regents. MANURE.—6 cwt. Manchester manure. PLANTING. —Dibbled.			
	3 sprayings.	1 spraying. + molasses.	Not sprayed.	1 spraying.

The results are recorded in the following table :—

Results.

RESULTS of the EXPERIMENTS to prevent POTATO DISEASE made at the Horticultural College, Swanley, 1892.

Variety of Potato.	Area Sown.	Size of Potato.	Plot 1.	Plot 2.	Plot 3.	Plot 4.
	Sq. yds.		Lbs.	Lbs.	Lbs.	Lbs.
The General - -	325	*Healthy* :—				
		Large -	392	392	352	302
		Medium	224	224	181½	182
		Small -	73	48½	49	56
		Diseased -	2½	1	8	½
Beauty of Hebron -	110	*Healthy* :—				
		Large -	168	224	168	233
		Medium	56	44½	59½	84
		Small -	14	13	12	22
		Diseased -	5	18	60	9

Experiments by the Kent County Council.

Variety of Potato.	Area Sown.	Size of Potato.	Plot 1.	Plot 2.	Plot 3.	Plot 4.
			Lbs.	Lbs.	Lbs.	Lbs.
Beauty of Hebron -	35	*Healthy* :—				
		Large -	56	48	36	65
		Medium	15	5½	12½	27
		Small -	3	2	2¼	11
		Diseased -	1½	3½	16¼	3½
Beauty of Hebron -	35	*Healthy* :—				
		Large -	56	82½	50½	59¾
		Medium	15	19½	20	24
		Small -	5	5¾	3	6
		Diseased -	¼	8¼	14½	5
Magnum Bonum -	60	*Healthy* :—				
		Large -	132	94½	82½	112
		Medium	19	22	22½	11
		Small -	4½	6½	6	12
		Diseased -	1	3½	5½	1¼
Snowflake - -	170	*Healthy* :—				
		Large -	168	168	163	224
		Medium	63	74	89½	82
		Small -	15½	26¼	20	26
		Diseased -	4	18	31	24½
Snowflake - -	178	*Healthy* :—				
		Large -	20	24	21	33
		Medium	32	35	35	32
		Small -	26	27	44	30
		Diseased -	¼	2½	5	1¼
Dunbar Rezents -	130	*Healthy* :—				
		Large -	179	132½	126	174
		Medium	77	76	63½	59
		Small -	22	30½	20	22
		Diseased -	2¼	35	40½	10
Total - -	1,040	- - -	1,835	1,824½	1,649½	1,888
		Healthy :—	Lbs.	Lbs.	Lbs.	Lbs.
Analysis -	- - -	Large -	1,171	1,165½	1,008	1,202¾
		Medium	501	500½	484	501
		Small -	163	158¾	157½	185
		Diseased -	17¼	90	180¾	55½

Note.—All the varieties were dibbled, with the exception of Magnum Bonum and Snowflake, which were baulked.

Cost per acre.

The Committee state in their Report of 20th October 1892 that a man using Vermorel's knapsack sprayer, known as the "Eclair," can spray about an acre in a day, the cost per acre being approximately—

	s.	*d.*
25 lbs. sulphate of copper, at 18*s.* 8*d.* per cwt -	4	2
25 lbs. quicklime - - - -	0	6
Labour - - - - - -	3	0
125 gallons water - - - -	0	0
	7	8

Experiments in Great Britain.

Experiments by the Kent County Council.

The trial plots of potatoes were dug on the 26th, 27th, and 28th September. The potatoes of adjoining plots, dug at the same time, were one fifth diseased.

The diseased tubers in experimental plots were found on comparatively few plants.

The Committee considered that no useful result was obtained by the addition of molasses to the mixture, but they found that the 2 per cent. solution of sulphate of copper and lime is efficacious in preventing potato disease, and they strongly recommend its general use.

Experiments by Messrs. Carter & Co. at Bromley.

Experiments by Messrs. Carter & Co.

In 1892 Messrs. Carter & Co. carried out a series of experiments with bouillie bordelaise at Bromley.

The land upon which the experiments were conducted is a poor clay sand on the London clay, and was in a most unsatisfactory condition when the potatoes were put in. Oats preceded the potatoes. Eight loads of farmyard manure were put on the acre of trial ground. It was twice ploughed, and the potatoes were planted on April 8th, 1892. The land was harrowed and horse-hoed twice.

The potatoes were put in 10 long double rows, the drills being 36 inches apart, a distance which some potato growers hold to be better and more profitable than closer planting.

Varieties of potatoes.

The following varieties were planted:—

Row No. 1.—Myatt's Ashleaf.
„ 2.—Snowdrop.
„ 3.—Beauty of Hebron.
„ 4.—White Elephant.
„ 5.—Carter's King ot the Russets.
„ 6.—Carter's Cosmopolitan.
„ 7.—Carter's Improved Magnum Bonum.
„ 8.—Bruce.
„ 9.—Carter's Surprise.
„ 10.—Imperator.

The whole piece was divided into four equal parts. The first and third of these parts was dressed with bouillie bordelaise; the second and fourth were not dressed at all.

Dates of application of dressings.

The first dressing was given on July 11th; the second on August 2nd.

The bouillie was made with 22 lbs. of sulphate of copper and 22 lbs. of lime to 100 gallons of water.

Disease appeared early in September in the undressed parts of the trial ground.

The potatoes were dug on the 15th and 16th of September, when the following results were noted and tabulated, as below :—

1. FIRST QUARTER PLOT.—DRESSED.

Row and Variety.	Weight of Sound Tubers.			Weight of Diseased Tubers.			Total.		
	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.
1. Myatt's	3	1	5	0	0	1½	3	1	6½
2. Snowdrops	2	2	12	0	0	1¾	2	2	13¾
3. Beauty of Hebron	2	3	18	0	0	2½	2	3	20½
4. White Elephant	3	2	19	0	0	2	3	2	21
5. King of the Russets	3	3	14		None		3	3	14
6. Cosmopolitan	2	2	7	0	0	0½	2	2	7½
7. Magnum Bonum	3	2	19		None		3	2	19
8. The Bruce	4	0	0		None		4	0	0
9. Carter's Surprise	3	2	10		None		3	2	10
10. Imperator	4	3	10		None		4	3	10
Totals	35	0	2	0	0	8¼	35	0	10¼

2. SECOND QUARTER PLOT.—UNDRESSED.

Row and Variety.	Weight of Sound Tubers.			Weight of Diseased Tubers.			Total.		
	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.
1. Myatt's	1	2	17	0	3	25	2	2	14
2. Snowdrops	1	3	10	0	1	21	2	1	3
3. Beauty of Hebron	2	0	10	0	1	12	2	1	22
4. White Elephant	2	0	25	0	3	21	3	0	18
5. King of the Russets	3	2	5	0	0	12	3	2	17
6. Cosmopolitan	2	0	0	0	1	7	2	1	7
7. Magnum Bonum	3	0	21	0	0	5	3	0	26
8. The Bruce	3	2	0	0	0	7	3	2	7
9. Carter's Surprise	2	1	10	0	0	25	2	2	7
10. Imperator	3	2	23	0	0	16	3	3	11
Totals	26	0	9	3	2	11	29	2	20

3. THIRD QUARTER PLOT.—DRESSED.

Row and Variety.	Weight of Sound Tubers.			Weight of Diseased Tubers.			Total.		
	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.
1. Myatt's	1	1	13	0	0	0¼	1	1	13¼
2. Snowdrops	1	1	21	0	0	0½	1	1	21½
3. Beauty of Hebron	1	3	12	0	0	1¾	1	3	13¾
4. White Elephant	2	3	17		None		2	3	17
5. King of the Russets	2	2	9		None		2	2	9
6. Cosmopolitan	1	2	7		None		1	2	7
7. Magnum Bonum	2	3	0		None		2	3	0
8. The Bruce	3	0	23		None		3	0	23
9. Carter's Surprise	2	2	0		None		2	2	0
10. Imperator	2	3	8	0	0	0¼	2	3	8¼
Totals	22	3	26	0	0	2¼	23	0	0¼

Experiments in Great Britain.

Experiments by Messrs. Carter & Co.

4. Fourth Quarter Plot.—Undressed.

Row and Variety.	Weight of Sound Tubers.			Weight of Diseased Tubers.			Total.		
	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.
1. Myatt's	0	3	14	0	1	14	1	1	0
2. Snowdrops	0	2	26	0	2	14	1	1	12
3. Beauty of Hebron	0	3	16	0	2	23	1	2	11
4. White Elephant	1	0	14	0	3	7	1	3	21
5. King of the Russets	1	2	0	0	1	0	1	3	0
6. Cosmopolitan	0	3	5	0	1	0	1	0	5
7. Magnum Bonum	1	0	20	0	0	1	1	0	21
8. The Bruce	3	1	11	0	0	2	3	1	13
9. Carter's Surprise	1	1	0	0	0	14	1	1	14
10. Imperator	2	1	7	0	0	20	2	1	27
Totals	14	0	1	3	1	11	17	1	12

Results of duplicate experiments.

The following table gives the totals of the two duplicate experiments:—

	Dressed Plots.			Undressed Plots.			In favour of Dressed Plots.		
	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.
Weight of sound tubers	58	0	0	39	2	10	18	1	18
Weight of unsound tubers	0	0	11	6	3	22	6	3	11
Total yield	58	0	11	46	2	4	11	2	7

The table appended here shows the rainfall and general weather conditions during the growth of the potatoes.

April 8th to 30th.—Rainfall, 1·50 inches (on ten days). The rain fell on continuous days from 24–25th to 28–29th (0·55 inches).

Frost was registered on 13 occasions from April 10th to 30th, in intensity ranging from 1 to 7 degrees.

Severe snowstorm 1 a.m. to 8 a.m. April 16th.

May.—Rainfall, 1·46 inches (on ten days). Very little rain (0·21 inches on eight days) until after the 24–25th; and on the 25–26th there was registered 0·97 inches.

Frost registered May 1st (5 degrees), May 7th (4 degrees).

June.—Rainfall, 2·64 inches (on 14 days). Thunderstorm 28th 8.30 p.m. to 11 p.m. Thermometer, lowest 35, highest 98.

July.—Rainfall, 2·53 inches (on eight days.) Very severe thunderstorm on the 14th, 10.15 a.m. and 12.30 midday, when 0·90 inches of rain fell. Thermometer, lowest 39, highest 90.

August.—Rainfall, 3.35 inches (on 16 days), the heaviest fall was 27–28th, 0·98 inches. Thermometer, lowest 38, highest 98.

September 1st to 14th.—Rainfall, 0·57 inches (on seven days.) Thermometer, lowest 35, highest, 83.

Experiments by Messrs. Carter & Co.

It should be noticed especially that in these experiments the treatment was intended to be solely a *preventive*, and by no means a *curative* measure, the dressing being applied before disease had appeared. No dressing was given when it was discovered that disease had made its appearance.

As Messrs. Carter put it, they wanted to prove whether it would pay potato-growers to insure, as it were, their potatoes against disease by dressing them twice, as a part of the regular routine of potato cultivation, at a cost of about 1*l.* per acre. They hold, and it is considered with much reason that they have shown by the results of these experiments, that such preventive dressing will pay well, seeing that the yield of the dressed portions of the trial ground was at the rate of two tons per acre more than that of the undressed parts. The quality of the potatoes also, was undoubtedly better on the dressed plots.

Preventive dressing pays well.

A noteworthy feature of these experiments is that double the quantity of lime was used for them compared with that used in the experiments conducted by the Royal Agricultural Society for the Board of Agriculture.

EXPERIMENTS IN IRELAND.

Experiments by Irish Land Commission.

Report on Experiments carried out by the Agricultural Department of the Irish Land Commission in 1892.

The Agricultural Department of the Irish Land Commission carried out a series of experiments during the late summer and autumn of 1892 for the purpose of testing the value of applications of sulphate of copper to the potato plant as a preventive of potato disease.

The farms upon which the experiments were conducted were situated as follows :—

Two near Tralee, county Kerry.
Two near Clonakilty, county Cork.
Two near Tramore, county Waterford.
Three near Brookeboro', county Fermanagh.

All these experiments were carried out under the superintendence of Mr. A. William West, M.R.A.C.

Further experiments were conducted by Mr. W. A. Barnes, of Westlands, Moynalty, Kells, county Meath, and by the Dungannon Board of Guardians, both being carried out in accordance with instructions given by this Department.

"Champion" variety experimented on.

In all cases the Champion variety of potato was selected for experiment, being the variety most generally grown for home consumption in Ireland. At each experimental station five quarter acre plots were carefully measured out; plots 1 to 4 were treated with the mixtures described in the following table, plot 5 was left untreated as a check plot :—

Materials Used.	Plot 1.	Plot 2.	Plot 3.	Plot 4.
	Per Acre.	Per Acre.	Per Acre.	Per Acre.
Pure sulphate of copper -	30 lbs.	30 lbs.	22½ lbs.	22⅔ lbs.
Unslacked lime - -	15 lbs.	15 lbs.	7½ lbs.	7⅔ lbs.
Water - - -	150 galls.	150 galls.	150 galls.	150 galls.
Treacle - - -	—	30 lbs.	—	22⅔ lbs.
	2 per cent. of copper sulphate.		1½ per cent. of copper sulphate.	

In all the experiments except No. 9 (Brookeboro') the plots were dressed three times at intervals of about three weeks; in experiment No. 9 the dressing was only applied once.

Care was taken in marking off the plots that they should be as nearly as possible similar with respect to soil, seed used, and

general treatment before and during the growth of the crops, but the soil varied considerably in the plots used for experiment No. 6, at Tramore, and for experiment No. 2 at Ardfert Abbey, the plots in the first instance being subject to springs, and those in the second case being partly situated on the slope of a rather steep hill.

Experiments by Irish Land Commission.

The sulphate of copper used was that known as pure sulphate of copper. A sample, drawn from the sulphate of copper sent out for the purposes of the experiments, was submitted to Sir Charles A. Cameron, Analyst to the City and County of Dublin, and was certified by him to be of 98·5 per cent. of purity

Sir Charles Cameron reported as follows:—

"City Laboratory,
"Municipal Buildings, Cork Hill,
"Dublin, July 20th, 1892.

"I have analysed a specimen of sulphate of copper submitted to me for that purpose by the Irish Land Commission, the only impurity present is sulphate of iron. The amount of iron present is 0·49 per cent. which would give an equivalent of 0·7 per cent. of peroxide of iron. The exact amount of pure sulphate of copper present is 98·5 per cent.

"(Signed), Charles A. Cameron."

The lime used was thoroughly well-burned, unslaked lime.

Preparation of dressings.

The spraying mixtures were prepared as follows:—

The requisite amount of copper sulphate was set to dissolve over night by placing it in a piece of coarse sacking, suspended in a wooden barrel containing two gallons of cold water to every pound of copper sulphate, or if this could not conveniently be done, the copper sulphate was ground to powder previous to being placed in water; when thus powdered it dissolves in a few minutes in cold water; the correct amount of unslacked lime was then placed in a bucket, and water was added until the lime would absorb no more; upon the whole of the lime being thoroughly slacked, sufficient water was added thereto to thoroughly cool the lime, producing a thin milk of lime, which was well stirred and then poured slowly into the copper sulphate solution, this mixture was then stirred for several minutes, after which sufficient cold water was added to dilute it to the required strength, the whole being continuously stirred. After thorough stirring, the mixture appeared azure-blue in colour, it was then allowed to rest in order that the precipitate should sink; if after standing for a few minutes the precipitate sank leaving a few inches in depth of clear liquid it was considered ready for use, but if the liquid to the depth mentioned instead of appearing clear was slightly tinged with blue, the mixture was again thoroughly stirred and allowed to rest a second time. This second stirring generally produced the desired effect, but if, as occurred in one or two instances, it did not, more lime was added, the bluish tinge showing that the whole of the copper had not been thoroughly precipitated; the addition of a few ounces of lime was found sufficient in each instance to bring about the

EXPERIMENTS IN IRELAND.

desired result. On being tested with litmus paper the mixture as thus prepared proved to be free from acidity.

Experiments by Irish Land Commission.

It will be observed by reference to the table above that the proportion of lime to copper sulphate used was as 1 to 2 on plots 1 and 2, and as 1 to 3 on plots 3 and 4; it was found that if the lime was thoroughly good, the latter proportion was sufficient to neutralize all the acid and to precipitate all the copper. Unless the acidity of the copper sulphate is neutralized the mixture would be injurious to the leaves of the potato plant, therefore, if the lime used is not of very good quality, it is advisable to use it in the proportion of one part of lime to two parts of copper sulphate.

Acidity of copper sulphate must be neutralised.

Treacle mixture.

When preparing the treacle mixture, sufficient water was added to the required amount of treacle to make it of a thin consistency, the diluted treacle was then added to the milk of lime, and after being thoroughly stirred, the mixture was poured into the copper solution in the barrel, the whole being again thoroughly stirred.

The object of adding treacle to the mixture applied to two of the plots in each experiment, was to ascertain whether the addition of treacle to the sulphate of copper mixture as recommended by M. Perret and M. Girard, would produce more satisfactory results than the applications of the ordinary bouillie bordelaise, M. Girard's experiments tending to show that the sucrated mixture was less liable to be washed off the potato leaves by rain.

Eclair sprayer used.

The mixture was applied by means of the "Éclair" knapsack spraying machine made by Vermorel, a full description of which appeared in the report of the experiments of a similar nature conducted by this Department in 1891. The machines, which cost 35*s.* each, proved most satisfactory in every respect.

The mixtures were prepared in the fields in which the experiments were carried out, forty gallon wooden paraffin barrels being used for the purpose.

In most of the experiments three machines were kept constantly at work; at other times two, four, or five machines were used. From the experience thus gained it was ascertained that one strong boy could attend three men operating the spraying, the boy being employed to carry fresh supplies of the mixture to the operators from barrels placed on the headlands, the mixture being well stirred before drawing a fresh supply.

Dressings applied from above and from underneath.

The mixture was applied to the plants both from above and from underneath, in every instance, excepts in experiment No. 5, the foliage of the crop in that instance being so rank, that it was found impossible to spray from underneath to any appreciable extent.

In each experiment the actual time occupied in preparing and appplying the mixture was noted down, and the following estimates of the cost of application to an average crop of

Experiments by Irish Land Commission.

Champions, with fully developed stalks, is based upon the information thus obtained :—

Three men using "Éclair" sprayers, attended by one boy, can apply 150 gallons to one statute acre in 5¼ hours.

If less than three men are employed the cost of attendance per acre is proportionately greater.

The price of the copper sulphate, delivered on the farm, may be estimated at 21*s.* per cwt. equal to 2¼*d.* per lb., and the price of treacle at 1*d.* per lb.

The cost of labour may be estimated at 2*s.* per diem for each man, and 1*s.* per diem for the attendant boy. The working day is calculated at 10½ hours.

The cost of each application per acre would be as follows :—

Cost of treatment.

Total cost of applying the 2 per cent. mixture with and without treacle :—

——	Plot I.	Plot II.
	£ s. d.	£ s. d.
3 men working Éclair sprayers	0 3 0	0 3 0
1 boy in attendance	0 0 6	0 0 6
30 lbs. copper sulphate at 2¼*d.* lb.	0 5 7½	0 5 7½
15 lbs. lime	—	—
30 lbs. treacle at 1*d.* lb.	—	0 2 6
Total per acre	0 9 1½	0 11 7½

Total cost of applying the 1½ per cent. mixture with and without treacle :—

——	Plot III.	Plot IV.
	£ s. d.	£ s. d.
3 men working "Éclair" sprayers	0 3 0	0 3 0
1 boy in attendance	0 0 6	0 0 6
22½ lbs. copper sulphate at 2¼*d.* lb.	0 4 2½	0 4 2½
7½ lbs. lime	—	—
22½ lbs. treacle at 1*d.* lb.	—	0 1 10½
Total per acre	0 7 8½	0 9 7

During the first three weeks of October a statute perch in each plot was carefully measured off and the potatoes therein dug; generally speaking, half a perch was taken in two different parts of each plot; the sound potatoes were separated from the unsound; the former were then further divided into two lots, one being marketable potatoes, fit for human consumption, the other lot being small potatoes, fit for feeding pigs, poultry, &c. The three lots were then separately weighed; in many instances a considerable amount of the tubers in the untreated plots were found to have rotted away.

The statistical results of the several experiments are shown on the following pages.

Experiments by Irish Land Commission.

Experiment No. I.

EXPERIMENT No. 1.—COUNTY KERRY.

Name.—DAVID WATSON. Address.—Ballysheen, Abbeydorney.

Source of Seed.—Imported from Forfar in 1891.

Date of first dressing.—Plot 1 on 30th June. Plots 2, 3, and 4 on 1st July.

Appearance of crop.—Perfectly healthy, but not a heavy show of foliage.

Weather at time of application.—30th June, a little windy. Heavy shower when half through plot 1. 1st July, bright sunny day.

General remarks.—On plot 1 the solution was unintentionally applied at the rate of 300 gallons per acre.

Date of second dressing.—22nd July.

Appearance of crop.—Still quite free from disease; the foliage did not appear to be as heavy on the treated as on the untreated plots.

Weather at time of application.—Fine.

Date of third dressing.—13th August.

Appearance of crop.—On plot 5 every plant was badly attacked by disease. On the four treated plots disease was only observable on two or three spots, and the plants appeared to have greater vitality than those untreated.

Weather at time of application.—Fine, but very windy.

General remarks.—Notwithstanding excessive rain during the whole of the day and night preceding the day on which the third dressing was applied, indications of the previous dressing were still to be observed in the form of a deposit upon the leaves and stalks.

YIELD of POTATOES and ESTIMATED VALUE of the PRODUCE, deducting the cost of Preventive Treatment calculated per Statute Acre, from the Results obtained upon the Experimental Plots.

Treatment, per Acre.	——	Total Sound.	Diseased.	Total Crop.	Cost of Application.
(1.)					
30 lbs. copper sulphate	Weight per acre -	T. c. lb. 8 6 48	T. c. lb. 0 6 88	T. c. lb. 8 13 24	
15 lbs. lime - - -	Per cent. to entire crop.	96·1	3·9	100·0	
150 gallons water -	Market value -	£ s. d. 15 6 5	£ s. d. —	£ s. d. 15 6 5	£ s. d. 1 7 4½
(2.)					
30 lbs. copper sulphate	Weight per acre -	T. c. lb. 7 12 96	T. c. lb. 0 6 8	T. c. lb. 7 18 104	
15 lbs. lime - -	Per cent. to entire crop.	96·18	3·82	100·0	
30 lbs. treacle - -					
150 gallons water - -	Market value -	£ s. d. 14 4 10	£ s. d. —	£ s. d. 14 4 10	£ s. d. 1 14 10½
(3.)					
22½ lbs. copper sulphate	Weight per acre -	T. c. lb. 9 5 40	T. c. lb. 0 8 4	T. c. lb. 9 13 44	
7½ lbs. lime - - -	Per cent. to entire crop.	95·0	4·1	100·0	
150 gallons water - -	Market value -	£ s. d. 17 16 9	£ s. d. —	£ s. d. 17 16 9	£ s. d. 1 3 1½
(4.)					
22½ lbs. copper sulphate	Weight per acre -	T. c. lb. 8 0 80	T. c. lb. 0 6 88	T. c. lb. 8 7 56	
7½ lbs. lime - - -	Per cent. to entire crop.	96·0	4·0	100·0	
22½ lbs. treacle - -					
150 gallons water -	Market value -	£ s. d. 15 8 7	£ s. d. —	£ s. d. 15 8 7	£ s. d. 1 8 9
(5.)					
	Weight per acre -	T. c. lb. 6 14 32	T. c. lb. 1 5 0	T. c. lb. 7 19 32	
Untreated - - -	Per cent. to entire crop.	84·3	15·7	100·0	
	Market value -	£ s. d. 12 10 8	£ s. d. —	£ s. d. 12 10 8	

Gain on three plots; loss of only 8½*d.*

On plots 1, 3, and 4 there was a net gain per acre of 1*l.* 8*s.* 4½*d.*, 4*l.* 2*s.* 11½*d.*, and 1*l.* 9*s.* 2*d.* respectively; while on plot 2 there was a loss of 8½*d.* per acre.

Experiments by Irish Land Commission.

Experiment No. II.

EXPERIMENT No. II.—County Kerry.

Name.—W. T. Talbot-Crosbie, Esquire.

Address.—Ardfert Abbey, Ardfert

Date of first dressing.—2nd July.

Appearance of crop.—A fine healthy looking crop.

Weather at time of application.—Raining off and on the whole time, sometimes heavily.

General remarks.—A great deal of time and inconvenience was saved in preparing the solution by using a water cart, which contained all the water required for dressing 1 acre.

Date of second dressing.—29th July.

Appearance of crop.—The blight was just appearing on the crop; more apparent on the untreated than on the treated plot; otherwise the crop was quite healthy and in flourishing condition.

Weather at time of application.—A very fine day with no wind.

Date of third dressing.—20th August.

Appearance of crop.—Treated plots quite green and many of the plants in flower. Plots 1 and 2 very slightly affected by disease, especially No. 1, on which only a few spots were to be seen. Plots 3 and 4 were not so free from disease as plot 1, but were still quite green in appearance. The untreated plot was a most marked contrast, being quite black with the disease and hardly a green leaf to be seen.

General remarks.—Very heavy rain during portions of the two days following.

Yield of Potatoes and Estimated Value of the Produce, deducting the cost of Preventive Treatment, calculated per Statute Acre, from the Results obtained upon the Experimental Plots.

Treatment per Acre.	—	Total Sound.	Diseased.	Total Crop.	Cost of Application.
(1.)		T. c. lb.	T. c. lb.	T. c. lb.	
30 lbs. copper sulphate	Weight per acre -	9 2 96	0 17 96	10 0 80	
15 lbs. lime - -	Per cent. to entire crop.	91·1	8·9	100·0	
150 gallons water - -	Market value -	£ s. d. 17 5 9	£ s. d. —	£ s. d. 17 5 9	£ s. d. 1 7 4½
(2.)		T. c. lb.	T. c. lb.	T. c. lb.	
30 lbs. copper sulphate	Weight per acre -	7 15 0	0 12 16	8 7 16	
15 lbs. lime - -	Per cent. to entire crop.	92·7	7·3	100·0	
30 lbs. treacle - -					
150 gallons water -	Market value -	£ s. d. 14 11 5	£ s. d. —	£ s. d. 14 11 5	£ s. d. 1 14 10½
(3.)		T. c. lb.	T. c. lb.	T. c. lb.	
22½ lbs. copper sulphate	Weight per acre -	7 4 32	0 17 96	8 2 16	
7½ lbs. lime - - -	Per cent. to entire crop.	89·0	11·0	100·0	
150 gallons water - -	Market value -	£ s. d. 13 16 5	£ s. d. —	£ s. d. 13 16 5	£ s. d. 1 3 1½
(4.)		T. c. lb.	T. c. lb.	T. c. lb.	
22½ lbs. copper sulphate	Weight per acre -	7 14 32	0 12 16	8 6 48	
7½ lbs. lime - - -	Per cent. to entire crop.	92·7	7·3	100·0	
22½ lbs. treacle - -					
150 gallons water -	Market value -	£ s. d. 14 7 10	£ s. d. —	£ s. d. 14 7 10	£ s. d. 1 3 9
(5.)		T. c. lb.	T. c. lb.	T. c. lb.	
Untreated - -	Weight per acre -	7 12 96	0 19 32	8 12 16	
	Per cent. to entire crop.	88·8	11·2	100·0	
	Market value -	£ s. d. 14 9 11	£ s. d. —	£ s. d. 14 9 11	

Loss on three plots.

Compared with the untreated plot, plot 1 showed a net gain per acre of 1*l.* 8*s.* 5½*d.*; while on plots 2, 3, and 4 there was a loss per acre of 1*l.* 13*s.* 4½*d.*, 1*l.* 16*s.* 7½*d.*, and 1*l.* 10*s.* 10*d.* respectively.

On these plots the dressing had, outwardly, as marked an effect on the crop as in any of the other experiments. The results obtained are possibly to a large extent due to variations in the quality of the soil in each plot. Plot 1 was at the base of a slope, plots 2, 3, and 4 were more or less on the slope, whilst plot 5 was on a flat table land above the other plots.

EXPERIMENTS IN IRELAND.

Experiments by Irish Land Commission.

Experiment No. III.

EXPERIMENT No. III.—County Cork.

Name.—D. O'Leary, C.T.C. Address.—Darara, Clonakilty

Date of first dressing.—6th July.

Appearance of crop.—A fair healthy crop. Early potatoes, next to the five plots of champions marked out for experiment, were very badly attacked with the blight. Only one spot was noticed on the champions.

Weather at time of application.—A heavy shower when about half through the dressing, after which fine.

General remarks.—This crop being in lazy beds, each man was made to spray one side of a bed going up the field and the other side returning.

Date of second dressing.—27th July.

Appearance of crop.—The untreated plot badly attacked with the blight. The foliage being, in places, quite discoloured. The four treated plots, although spotted, were quite green and flourishing. The difference between the foliage of treated and untreated was most marked.

Weather at time of application.—Very fine.

Date of third dressing.—18th August.

Appearance of crop.—Untreated plot a mass of diseased stalks, and no green leaves to be seen. Treated plots quite green and remarkably free from disease, being only very slightly spotted, and to all appearance still growing.

Yield of Potatoes and Estimated Value of the Produce, deducting the cost of Preventive Treatment, calculated per Statute Acre, from the Results obtained upon the Experimental Plots.

Treatment per Acre.	—	Total Sound.	Diseased.	Total Crop.	Cost of Application.
(1.)		T. c. lb.	T. c. lb.	T. c. lb.	
30 lbs. copper sulphate	Weight per acre -	9 2 16	0 4 32	9 6 48	
15 lbs. lime - - -	Per cent. to entire crop.	97·7	2·3	100·0	
150 gallons water -	Market value -	£ s. d. 16 17 2	£ s. d. —	£ s. d. 16 17 2	£ s. d. 1 7 4½
(2.)		T. c. lb.	T. c. lb.	T. c. lb.	
30 lbs. copper sulphate	Weight per acre -	8 9 32	None.	8 9 32	
15 lbs. lime - -	Per cent. to entire crop.	100·0	0·0	100·0	
30 lbs. treacle - -					
150 gallons water - -	Market value -	£ s. d. 16 0 8	£ s. d. —	£ s. d. 16 0 8	£ s. d. 1 14 10½
(3.)		T. c. lb.	T. c. lb.	T. c. lb.	
22½ lbs. copper sulphate	Weight per acre -	7 15 80	0 6 48	8 2 16	
7½ lbs. lime - -	Per cent. to entire crop.	96·03	3·97	100·0	
150 gallons water -	Market value -	£ s. d. 14 13 7	£ s. d. —	£ s. d. 14 13 7	£ s. d. 1 3 1½
(4.)		T. c. lb.	T. c. lb.	T. c. lb.	
22½ lbs. copper sulphate	Weight per acre -	8 7 96	0 2 16	8 10 0	
7½ lbs. lime - - -	Per cent. to entire crop.	98.8	1·2	100·0	
22½ lbs. treacle - -					
150 gallons water -	Market value -	£ s. d. 15 19 3	£ s. d. —	£ s. d. 5 19 3	£ s. d. 1 8 9
(5.)		T. c. lb.	T. c. lb.	T. c. lb.	
	Weight per acre -	3 7 96	0 10 80	3 18 64	
Untreated - - -	Per cent. to entire crop.	86·4	13·6	100·0	
	Market value -	£ s. d. 6 9 11	£ s. d. —	£ s. d. 6 9 11	

Gain on all dressed plots.

All the dressed plots showed a gain from the treatment, the net gain per acre on each plot being as follows:—Plot 1, 8*l.* 19*s.* 10½*d.*; plot 2, 7*l.* 15*s.* 10½*d.*; plot 3, 7*l.* 0*s.* 6½*d.*; plot 4, 8*l.* 0*s.* 7*d.*

EXPERIMENT No. IV.—County Cork.

Name.—M. Donovan. Address.—Gullane, Clonakilty.

Date of first dressing. 5th July.

Appearance of crop.—A fine healthy crop with heavy foliage. Some early potatoes in close proximity were blighted.

Weather at time of application.—At first a light drizzly rain, then quite fine.

General remarks.—This crop was in lazy beds, the haulms were so big that it was most difficult to carry the solution to the men.

Date of second dressing.—26th July.

Appearance of crop.—Both treated and untreated were spotted by the disease, but it was not so apparent on the untreated plots. There was no difference discernible among the four treated plots.

Weather at time of application.—Very fine.

Date of third dressing.—17th August, plots 1, 3, and 4; 18th August, plot 2.

Appearance of crop.—The treated plots, although spotted by disease, were quite fresh and green, a few leaves here and there turning yellow from natural decay. On the untreated plot the leaves had been quite destroyed by the blight, leaving the stalks only. There was no difference to be seen between the four treated plots, with the exception that the outside ridge of plot 1 was spotted with the blight more than the rest. This was considered due to its having been next a few ridges of early potatoes which were not dressed.

Yield of Potatoes and Estimated Value of the Produce, deducting the cost of Preventive Treatment, calculated per Statute Acre, from the Results obtained upon the Experimental Plots.

Treatment per Acre.	—	Total Sound.	Diseased.	Total Crop.	Cost of Application.
(1.)		T. c. lb.	T. c. lb.	T. c. lb.	
30 lbs. copper sulphate	Weight per acre -	8 15 0	0 8 64	9 3 64	
15 lbs. lime - - -	Per cent. to entire crop.	96·3	4·7	100·0	
150 gallons water - -	Market value -	£ s. d. 16 10 0	£ s. d. —	£ s. d. 16 10 0	£ s. d. 1 7 4½
(2.)		T. c. lb.	T. c. lb.	T. c. lb.	
30 lbs. copper sulphate	Weight per acre -	10 3 64	0 3 104	10 7 56	
15 lbs. lime - - -	Per cent. to entire crop.	98·2	1·8	100·0	
30 lbs. treacle - -					
150 gallons water -	Market value -	£ s. d. 19 0 0	£ s. d. —	£ s. d. 19 0 0	£ s. d. 1 14 10½
(4.)		T. c. lb.	T. c. lb.	T. c. lb.	
22½ lbs. copper sulphate	Weight per acre -	8 1 48	0 3 24	8 4 72	
7½ lbs. lime - - -	Per cent. to entire crop.	98·1	1·9	100·0	
22½ lbs. treacle - -					
150 gallons water - -	Market value -	£ s. d. 15 5 9	£ s. d. —	£ s. d. 15 5 9	£ s. d. 1 8 9
(5.)		T. c. lb.	T. c. lb.	T. c. lb.	
Untreated - -	Weight per acre -	7 17 96	0 6 48	8 4 32	
	Per cent. to entire crop.	96·1	3·9	100·0	
	Market value -	£ s. d. 14 7 10	£ s. d. —	£ s. d. 14 7 10	

Plot 2 was the only plot next the untreated plot, and the portions dug for purposes of weighing in both these plots were within a few feet of one another; plot 3 had been dug before Mr. West visited the farm to test results.

Gain on two plots, loss on one.

Plots 1 and 2 showed a net gain from the treatment of 14*s.* 9½*d.* and 2*l.* 17*s.* 3½*d.* per acre respectively, while on plot 4 there was a net loss per acre of 10*s.* 10*d.*

Experiments by Irish Land Commission.

Experiment No. V.

EXPERIMENT No. V.—County Waterford.

Name.—John Halley. Address.—Crobally, near Tramore.

Date of first dressing.—11th July.

Appearance of crop.—A magnificent crop; quite healthy and free from disease.

Weather at time of application.—Fine whilst spraying, but windy. Thunderstorm with exceedingly heavy rain, immediately after dressing.

General remarks.—The foliage being very high, close matted, it was impossible to carry the mixture in buckets up the drills to the men, who therefore had to return to refill the sprayers; this took up considerable time. In the case of heavy foliage like this, the plan adopted was to make each man walk backwards between the drills, spraying one side only of the drills on each side of him. This method prevents the solution being rubbed off on the men's trousers, and ensures the work being more thoroughly done.

Date of second dressing.—3rd August.

Appearance of crop.—Untreated plot badly attacked with the blight. Treated plots only slightly spotted.

Weather at time of application.—Very fine.

Date of third dressing.—23rd August.

Appearance of crop.—Treated plots quite green, with an enormous growth, and very slightly spotted by the blight. On the untreated plot the stalks only were left, the leaves being quite dark and dishevelled from the effects of the disease. The line of demarcation between the treated and untreated plots was most marked.

Weather at time of application.—A dull but fine day.

General remarks.—The foliage of this crop was too dense to allow of underneath spraying to any extent, and was nearly all dressed from above. All the treated plots except one, had been dug before Mr. West visited the farm to test results.

Yield of Potatoes and Estimated Value of the Produce, deducting the cost of Preventive Treatment, calculated per statute acre, from the Results obtained upon the Experimental Plots.

Treatment per Acre.	—	Total Sound.	Diseased.	Total Crop.	Cost of Application.
22½ lbs. copper sulphate 7½ lbs. lime 22½ lbs. treacle 150 gallons water	Weight per acre	T. c. lb. 10 0 0	T. c. lb. 0 14 32	T. c. lb. 10 14 32	
	Per cent. to entire crop.	93·3	6·7	100·0	
	Market value	£ s. d. 18 7 1	£ s. d. —	£ s. d. 18 7 1	£ s. d. 1 8 9
Untreated	Weight per acre	T. c. lb. 6 8 64	T. c. lb. 0 18 64	T. c. lb. 7 7 16	
	Per cent. to entire crop.	87·4	12·6	100·0	
	Market value	£ s. d. 11 8 7	£ s. d. —	£ s. d. 11 8 7	

Net gain from treatment, 5*l.* 9*s.* 9*d.*

In this experiment the portions of the treated and untreated plots dug for weighing were within 9 feet of one another.

The net gain per acre from the treatment amounted to 5*l.* 9*s.* 9*d.*

EXPERIMENT No. VI.—County Waterford.

Name.—Walter Halley. Address.—Coolnacapogue, near Tramore.

Source of Seed.—Home-grown Champions.

Date of first dressing.—12th July.

Appearance of crop.—A very light crop of potatoes, but quite healthy, and free from disease.

Weather at time of application.—Raining, off and on, the whole time.

Date of second dressing.—2nd August.

Appearance of crop.—Blight appearing on the untreated plot; very few spots to be seen on the four treated plots. The previous dressing was still to be observed upon the leaves.

Date of third dressing.—25th August.

Appearance of crop.—Treated plots quite green, and many of the plants in flower. The upper leaves of a great many plants were slightly spotted with the blight; the lower leaves were quite free from disease, and covered with the previous dressing. This showed that the upper leaves had sheltered the lower ones from the beating action of the rain. Untreated plot quite dark from disease.

Weather at time of application.—Bright and sunny.

Yield of Potatoes and Estimated Value of the Produce, deducting the Cost of Preventive Treatment, calculated per Statute Acre, from the Results obtained upon the Experimental Plots.

Treatment per Acre.	—	Total Sound.	Diseased.	Total Crop.	Cost of Application.
(1.)		T. c. lb.	T. c. lb.	T. c. lb.	
30 lbs. copper sulphate	Weight per acre -	9 3 64	0 5 80	9 9 32	
15 lbs. lime - - -	Per cent. to entire crop.	97·0	3·0	100·0	
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
150 gallons water - -	Market value -	17 5 0	—	17 5 0	1 7 4½
(2.)		T. c. lb.	T. c. lb.	T. c. lb.	
30 lbs. copper sulphate	Weight per acre -	7 15 0	0 0 10	7 15 10	
15 lbs. lime - - -	Per cent. to entire crop.	99·97	·03	100·0	
30 lbs. treacle - -					
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
150 gallons water - -	Market value -	14 15 0	—	14 15 0	1 14 10½
(3.)		T. c. lb.	T. c. lb.	T. c. lb.	
22½ lbs. copper sulphate	Weight per acre -	6 15 0	0 5 0	7 0 0	
7½ lbs. lime - - -	Per cent. to entire crop.	96·4	3·6	100·0	
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
150 gallons water - -	Market value -	12 16 5	—	12 16 5	1 3 1½
(4.)		T. c. lb.	T. c. lb.	T. c. lb.	
22½ lbs. copper sulphate	Weight per acre -	8 0 0	0 5 0	8 5 0	
7½ lbs. lime - - -	Per cent. to entire crop.	97·0	3·0	100·0	
22½ lbs. treacle - -					
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
150 gallons water - -	Market value -	15 1 5	—	15 1 5	1 8 9
(5.)		T. c. lb.	T. c. lb.	T. c. lb.	
	Weight per acre -	6 18 64	0 7 96	7 6 48	
Untreated - - -	Per cent. to entire crop.	94·6	5·4	100.0	
		£ s. d.	£ s. d.	£ s. d.	
	Market value -	12 12 10	—	12 12 10	

On plots 1, 2, and 4 the results showed a net gain from the treatment of 3*l.* 4*s.* 9½*d.*, 7*s.* 3½*d.*, and 12*s.* 10*d.* per acre respectively; but on plot 3 there was a loss of 19*s.* 6½*d.*

Gain on three plots, loss on one.

Experiments by Irish Land Commission.

Experiment No. VII.

EXPERIMENT No. VII.—County Fermanagh.

Name.—A. G. West, Esq. Address.—Ardunshin, near Brookeboro'.

Date of first dressing.—18th July.

Appearance of crop.—A fine crop, quite free from the disease.

Weather at time of application.—Occasional light showers of rain.

Date of second dressing.—8th August.

Appearance of crop.—Quite free from the disease. The four treated plots appeared fresher and a darker green colour than the untreated plot. The previous dressing was still to be observed.

Weather at time of application.—Very fine, but windy.

Date of third dressing.—10th September.

Appearance of crop.—The untreated plot quite brown with disease, and hardly a green leaf to be seen. Treated plots growing vigorously. Here and there a few plants turning yellow from natural decay.

Yield of Potatoes and Estimated Value of the Produce, deducting the Cost of Preventive Treatment, calculated per Statute Acre, from the Results obtained upon the Experimental Plots.

Treatment per Acre.	—	Total Sound.	Diseased.	Total Crop.	Cost of Application.
(1.)					
30 lbs. copper sulphate	Weight per acre -	T. c. lb. 10 8 24	T. c. lb. None	T. c. lb. 10 8 24	
15 lbs. lime - - -	Per cent. to entire crop.	100·0	0·0	100·0	
150 gallons water - -	Market value -	£ s. d. 19 4 4	£ s. d. —	£ s. d. 19 4 4	£ s. d. 1 7 4½
(2.)					
30 lbs. copper sulphate	Weight per acre -	T. c. lb. 9 0 80	T. c. lb. None	T. c. lb. 9 0 80	
15 lbs. lime - - -	Per cent. to entire crop.	100·0	0·0	100·0	
30 lbs. treacle - -					
150 gallons water - -	Market value -	£ s. d. 16 12 1	£ s. d. —	£ s. d. 16 12 1	£ s. d. 1 14 10½
(3.)					
22½ lbs. copper sulphate	Weight per acre -	T. c. lb. 8 10 0	T. c. lb. 0 2 16	T. c. lb. 8 12 16	
7½ lbs. lime - - -	Per cent. to entire crop.	98·75	1·25	100·0	
150 gallons water - -	Market value -	£ s. d. 15 8 7	£ s. d. —	£ s. d. 15 8 7	£ s. d. 1 3 1½
(4.)					
22½ lbs. copper sulphate	Weight per acre -	T. c. lb. 8 2 96	T. c. lb. None	T. c. lb. 8 2 96	
7½ lbs. lime - - -	Per cent. to entire crop.	100·0	0·0	100·0	
22½ lbs. treacle - -					
150 gallons water - -	Market value -	£ s. d. 3	£ s. d. —	£ s. d. 14 4 3	£ s. d. 1 8 9
(5.)					
	Weight per acre -	T. c. lb. 6 10 0	T. c. lb. 1 0 0	T. c. lb. 7 0 0	
Untreated - - -	Per cent. to entire crop.	86·7	13·3	100·0	
	Market value -	£ s. d. 11 17 11	£ s. d. —	£ s. d. 11 17 11	

Net gain on all plots from treatment.

All the dressed plots yielded results which testified to the value of the treatment, the net gain per acre on each plot was as follows:—Plot 1, 5*l.* 19*s.* 0½*d.*; plot 2, 2*l.* 19*s.* 3½*d.*; plot 3, 2*l.* 7*s.* 6½*d.*: and plot 4, 17*s.* 7*d.*

EXPERIMENT No. VIII.—County Fermanagh.

Name.—Francis Murphy. Address.—Tullynagowan, near Brookeboro'.

Date of first dressing.—22nd July.

Appearance of crop.—A poor crop. Quite free from disease.

Weather at time of application.—Fine.

Date of second dressing.—10th August.

Appearance of crop.—Treated and untreated plots quite free from disease. The four treated plots were of a darker green colour than the untreated plot. The previous dressing was still to be observed on the leaves.

Weather at time of application.—Fine and sunny.

Date of third dressing.—13th September.

Appearance of crop.—Not a green leaf left on the untreated plot. The four treated plots were quite green and growing vigorously.

Yield of Potatoes and Estimated Value of the Produce, deducting the Cost of Preventive Treatment, calculated per Statute Acre, from the Results obtained upon the Experimental Plots.

Treatment, per Acre.	—	Total Sound.	Diseased.	Total Crop.	Cost of Application.
(2.) 30 lbs. copper sulphate, 15 lbs. lime, 30 lbs. treacle, 150 gallons water	Weight per acre	T. c. lb. 5 12 16	T. c. lb. 0 0 20	T. c. lb. 5 12 36	
	Per cent. to entire crop.	99·83	·17	100·0	
	Market value	£ s. d. 10 5 9	£ s. d. —	£ s. d. 10 5 9	£ s. d. 1 14 10½
(3.) 22½ lbs. copper sulphate, 7½ lbs. lime, 150 gallons water	Weight per acre	T. c. lb. 4 5 0	T. c. lb. 0 1 48	T. c. lb. 4 6 48	
	Per cent. to entire crop.	98·4	1·6	100·0	
	Market value	£ s. d. 7 9 3	£ s. d. —	£ s. d. 7 9 3	£ s. d. 1 3 1½
(4.) 22½ lbs. copper sulphate, 7½ lbs. lime, 22½ lbs. treacle, 150 gallons water	Weight per acre	T. c. lb. 5 8 64	T. c. lb. 0 0 40	T. c. lb. 5 8 104	
	Per cent. to entire crop.	99·67	·33	100·00	
	Market value	£ s. d. 9 12 10	£ s. d. —	£ s. d. 9 12 10	£ s. d. 1 8 9
(5.) Untreated	Weight per acre	T. c. lb. 3 18 64	T. c. lb. 0 10 0	T. c. lb. 4 8 64	
	Per cent. to entire crop.	88·7	11·3	100·0	
	Market value	£ s. d. 6 15 0	£ s. d. —	£ s. d. 6 15 0	

Plot 1 had been dug before Mr. West visited the farm to test results. The net gain per acre on plot 2 from the treatment was 1*l.* 15*s.* 10½*d.*; and on plot 4 there was a gain of 1*l.* 9*s.* 1*d.* But on plot 3 the results showed a loss of 8*s.* 10½*d.* per acre.

Gain on two plots, loss on one.

Experiments in Ireland.

EXPERIMENT No. IX.—County Fermanagh.

Experiments by Irish Land Commission.

Name.—R. Little. Address.—Tyrenny, near Brookeboro'.

Experiment No. IX.

Date of dressing.—25th July.

Appearance of crop.—A good healthy crop free from disease.

Weather at time of application.—Fine, sunny at times.

Yield of Potatoes and Estimated Value of the Produce, deducting the Cost of Preventive Treatment, calculated per Statute Acre, from the Results obtained upon the Experimental Plots.

Treatment, per Acre.	——	Total Sound.	Diseased	Total Crop.	Cost of Application.
(1.) 30 lbs. copper sulphate, 15 lbs. lime, 150 gallons water	Weight per acre	T. c. lb. 7 0 0	T. c. lb. None.	T. c. lb. 7 0 0	
	Per cent. to entire crop.	100·0	0·0	100·0	
	Market value	£ s. d. 12 17 1	£ s. d. —	£ s. d. 12 17 1	£ s. d. 0 9 1½
(2.) 30 lbs. copper sulphate, 15 lbs. lime, 30 lbs. treacle, 150 gallons water	Weight per acre	T. c. lb. 8 8 64	T. c. lb. None.	T. c. lb. 8 8 64	
	Per cent. to entire crop.	100·0	0·0	100·0	
	Market value	£ s. d. 15 14 3	£ s. d. —	£ s. d. 15 14 3	£ s. d. 0 11 7½
(3.) 22½ lbs. copper sulphate, 7½ lbs. lime, 150 gallons water	Weight per acre	T. c. lb. 7 2 96	T. c. lb. 0 0 80	T. c. lb. 7 3 64	
	Per cent. to entire crop.	99·6	0·4	100·0	
	Market value	£ s. d. 12 18 7	£ s. d. —	£ s. d. 12 18 7	£ s. d. 0 7 8½
(4.) 22½ lbs. copper sulphate, 7½ lbs. lime, 22½ lbs. treacle, 150 gallons water	Weight per acre	T. c. lb. 7 12 96	T. c. lb. 0 0 40	T. c. lb. 7 13 24	
	Per cent. to entire crop.	99·8	0·2	100·0	
	Market value	£ s. d. 13 17 2	£ s. d. —	£ s. d. 13 17 2	£ s. d. 0 9 7
(5.) Untreated	Weight per acre	T. c. lb. 5 17 96	T. c. lb. 0 3 64	T. c. lb. 6 1 48	
	Per cent. to entire crop.	97·1	2·9	100·0	
	Market value	£ s. d. 10 9 3	£ s. d. —	£ s. d. 10 9 3	

All plots benefited by

All the plots benefited by the treatment. On plot 1 the net gain per acre was 1*l.* 18*s.* 8½*d.* and on plots 2, 3, and 4 the results showed a gain per acre of 4*l.* 13*s.* 4½*d.*, *l.* 1*s.* 7½*d.*, and 2*l.* 18*s.* 4*d.* respectively.

Experiments by Irish Land Commission. Experiment at Westland.

EXPERIMENT carried out by MR. W. A BARNES, at Westland, Moynalty, Kells, County Meath.

MR. BARNES reported as follows:—

"The weather was very showery at the time the dressings were applied, and therefore I would not place much reliance on the comparative results between the plots dressed with and without treacle. It will be observed that one treacle plot gave the heaviest yield of the four, while the other gave the lowest, this is accounted for by a very heavy shower coming on shortly after the latter had been dressed."

YIELD of POTATOES and ESTIMATED VALUE of the PRODUCE, deducting the cost of Preventive Treatment, calculated per Statute Acre, from the results obtained upon the Experimental Plots.

Treatment per Acre.	—	Total Sound.	Diseased.	Total Crop.	Cost of Application.
(1.)					
30 lbs. copper sulphate	Weight per acre -	T. c. lb. 13 16 28	T. c. lb. 0 3 63	T. c. lb. 13 19 91	
15 lbs. lime - - -	Per cent. to entire crop.	98·7	1·3	100·0	
150 gallons water - -	Market value -	£ s. d. 26 15 9	£ s. d. 0 1 9	£ s. d. 26 17 6	£ s. d. 3 0 0
(2.)					
30 lbs. copper sulphate	Weight per acre -	T. c. lb. 12 11 28	T. c. lb. 0 3 28	T. c. lb. 12 14 56	
15 lbs. lime - - -	Per cent. to entire crop.	98·7	1·3	100·0	
30 lbs. treacle - -					
150 gallons water - -	Market value -	£ s. d. 24 8 4	£ s. d. 0 1 7	£ s. d. 24 9 11	£ s. d. 3 10 0
(3.)					
22½ lbs. copper sulphate	Weight per acre -	T. c. lb. 13 18 84	T. c. lb. 0 2 88	T. c. lb. 14 1 60	
7½ lbs. lime - - -	Per cent. to entire crop.	99·0	1·0	100·0	
150 gallons water - -	Market value -	£ s. d. 27 3 5	£ s. d. 0 1 4	£ s. d. 27 4 9	£ s. d. 2 17 6
(4.)					
22½ lbs. copper sulphate	Weight per acre -	T. c. lb. 14 5 0	T. c. lb. 0 2 28	T. c. lb. 14 7 28	
7½ lbs. lime - - -	Per cent. to entire crop.	99·2	0·8	100·0	
22½ lbs. treacle - -					
150 gallons water - -	Market value -	£ s. d. 28 0 5	£ s. d. 0 1 1	£ s. d. 28 1 6	£ s. d. 3 5 0
(5.)					
	Weight per acre -	T. c. lb. 9 13 56	T. c. lb. 0 17 56	T. c. lb. 10 11 0	
Untreated - - -	Per cent. to entire crop.	91·7	8·3	100·0	
	Market value -	£ s. d. 18 9 8	£ s. d. 0 8 9	£ s. d. 18 18 5	

The results of the experiments at Westland showed a gain from the treatment on all the dressed plots. The net gain per acre in each case was as follows:—On plot 1, 4*l.* 18*s.* 1*d.*; plot 2, 2*l.* 1*s.* 6*d.*; plot 3, 5*l.* 8*s.* 10*d.*; plot 4, 5*l.* 18*s.* 1*d.*

Gain on all dressed plots.

Experiments in Ireland.

Report of Experiment conducted by the Dungannon Board of Guardians on the Workhouse Grounds at Dungannon.

Experiments by Irish Land Commission.

The following report was made by Mr. Thomas Tackaberry, Workhouse Master, who superintended the experiment.

"The total area of the plots treated on the workhouse grounds was about 1½ statute acres.

"The area tested by digging and weighing was 44 yards of a 27-inch drill in the dressed plot, from which was obtained 6 stone 2 lb. of marketable potatoes as compared with 4 stone 12 lbs. in the same length of an undressed drill. No notice was taken of the small or black potatoes, which were trifling in both cases. The mixture was applied once, and the time occupied was 1½ days for a man and an attendant. The crop was dressed about the middle of July, the weather being dry and warm at the time.

"The leaves and stalks of the treated potatoes continued green and healthy for about three weeks longer than those of the untreated. Taking into account the fact that the workhouse grounds are very much worn by continued cropping, I consider the result highly satisfactory."

Mixture without treacle adhered as well as that with.

So far as could be judged by the eye the mixture without treacle remained on the leaves equally as long as that to which treacle had been applied.

In every instance the foliage of the treated plots remained green for from three to five weeks longer than that of the untreated plots.

The tubers dug in the treated plots were generally larger than those in the untreated plots, and the former when cooked and eaten were found to be of better quality than the latter.

Allowing for differences in quality of soil and uneven manuring, the general results of the experiments favour the application of a 2 per cent. mixture, without treacle.

About 150 gallons per acre is sufficient to dress thoroughly an average crop of Champions with fully developed foliage, 80 to 100 gallons per acre is sufficient for a crop without much foliage. Much depends on the skill of the operator.

Experiment No. 9 tends to show that a single dressing applied at the proper time may be quite sufficient.

Potato-disease was very prevalent in every district in which the experiments were conducted.

In order to ascertain if any portion of the mixture applied had been absorbed by the leaves or stalks of the plants which had been sprayed, two samples of leaves and stalks, one of which had been treated with the sulphate of copper and lime mixture, and the other with the sulphate of copper, lime, and treacle mixture, were submitted to Sir Charles Cameron for analysis. A sample of potatoes grown on the first mentioned plot, the foliage of which was analysed, was also submitted for analysis; it will be seen from Sir Charles Cameron's report, that each sample of leaves and stalks absorbed a certain amount of copper, but that the tubers did not contain more copper than might be found in any samples of tubers, the foliage of which had not been so treated.

Tubers did not contain copper.

The very full reports supplied by Sir Charles Cameron will prove of much interest.

REPORT from Sir CHARLES A. CAMERON, M.D., D.P.H. (Cambridge), F.R.C.S.I., M.R.C.P.I., F.I.C., Medical Officer of Health for Dublin, City and County Analyst.

City Laboratory,
Municipal Buildings,
Dublin, November 25th, 1892.

Experiments by Irish Land Commission. Sir Charles Cameron's investigation.

At the request of the Irish Land Commissioners I have carried out the following investigation:—

Specimens of (1) potato stalks, (2) potato leaves which had been treated with solution of sulphate of copper, (3) specimen of potato stalks, and (4) potato leaves which had been treated with sulphate of copper and treacle, were analysed as follows:—

300 grammes (nearly 12 ozs.) of each of the above specimens were placed in a porcelain basin under a water tap and thoroughly washed. After four days' washing it was considered impossible that the most minute trace of copper sulphate could have remained on the leaves or stalks. The washings were, towards the close of the process, tested for copper by evaporating a large quantity to a minute proportion, and applying to the latter appropriate tests which proved to be negative.

Each specimen after being washed was treated as follows:—It was dried and then burned in a large platinum dish. The specimens were at first charred, allowed to cool and their soluble constituents exhausted by treatment with distilled water. The residue of charred matter was then heated until everything organic and volatile was expelled. To prevent any copper, if present, being volatilised, the blowpipe flame was not applied to the platinum vessel, and the temperature was not raised above dull redness. A greyish ash having been obtained by the incineration of the specimens, the saline matter obtained from the charred masses was added to the grey mass, and the mixture boiled for several hours in dilute pure nitric acid. By this process it was intended to get into solution any copper that might be present in the ash.

Sulphate of copper is soluble in water, but on being calcined in contact with organic matter, the sulphate would be reduced to an insoluble sulphide, or if the temperature were very high, and organic matter present, to metal. The nitric acid solution was next filtered off the insoluble matter associated with it, and concentrated so as to get rid of most of the nitric acid. On diluting the concentrated solution with distilled water, and the addition of ammonia in excess, a bulky precipitate of the oxide of iron, phosphate of calcium, &c., took place. On the subsidence of the precipitate, a blue solution, indicative of the presence of copper, was seen. The solution obtained from the leaves was a much deeper blue than that yielded by the stalks; and the solutions obtained from the specimens treated with sulphate of copper only were of deeper hue than the corresponding solutions obtained from the specimens treated with sulphate of copper and treacle.

The amount of copper in each solution was determined by precipitating it as a sulphide, by transmitting sulphuretted hydrogen gas through the solution. It is unnecessary to mention here all the precautions necessary to be taken to ensure the accuracy of this method of determining the amount of copper in a solution; they were fully observed.

The amount of copper having been ascertained, according to the atomic laws, its equivalent as crystallized sulphate of copper ($CuSO_4$, 5 H_2O) was calculated.

Amount of copper found in potato stalks and leaves:—

Amount of copper in stalks and leaves.

	Treated with Copper Sulphate, and Treacle, 100 parts contain—		Treacle with Copper, Sulphate, 100 parts contain—	
	Leaves.	Stalks.	Leaves.	Stalks.
Copper - - - -	0·0412	0·0078	0·0527	0·0123
Equal to crystallized sulphate of copper.	0·1630	0·0307	0·2083	0·0506

EXPERIMENTS IN IRELAND.

Experiments by Irish Land Commission.

The quantities of sulphate of copper absorbed by the potato leaves is very great. In those treated with sulphate of copper alone, the quantity amounts to more than two parts per thousand. The stalks have absorbed very much less than the leaves. The presence of treacle materially prevented the absorption of the copper. It is remarkable that sulphate of copper, which is a tolerably soluble salt, should so freely enter into the tissues of the potato leaves, and remain there, notwithstanding that the leaves were under a water tap for four days. No doubt, the copper became fixed or insoluble in the plants.

I mixed sulphate of copper, lime and water, in the proportions in which they were applied to the potatoes, namely, 15 parts of sulphate, 7½ of lime, and 1,500 of water. The lime is much more than sufficient to precipitate the copper, as hydroxide or hydrated oxide, the excess of lime and the hydrated oxide, precipitate, leaving sulphate of lime in solution. I found that the clear solution did not contain any copper. It is strange how the plants can absorb copper under these circumstances, the hydrated oxide being insoluble. I passed a stream of carbonic acid gas through the suspended oxide of copper, but by this treatment only a minute quantity of the copper went into solution. The rain water which falls on the potatoes contains carbonic acid, which might possibly dissolve a little of the copper oxide and convey it into the plants In some way, however, the copper finds its way into the plant, no doubt through the stomata or pores. How far it penetrates has yet to be determined. Nor can it be considered as a settled matter that the copper absorbed protects the plant from the ravages of the fungus.

Copper occurs naturally in many food substances, but only in minute quantities. Duclaux states that he detected in 1,000 parts of cocoa-beans from 0·009 to 0·04 of copper, and in 1,000 parts of the outer shell, from 0·035 to 0·225 of copper. These are small quantities when compared with the amounts which I have found in the potato leaves.

(Signed) CHARLES A. CAMERON,
Professor of Chemistry, R.C.S.I., Lecturer on Agricultural Chemistry and Geology, Glasnevin Government Farm.

Department of the Medical Officer of Health and Public Analyst.

Public Health Office, Cork Hill, City Laboratory,
17, Castle Street, Dublin,
December 21, 1892.

Only infinitesimal trace of copper in tubers.

SIR,—I beg to inform you that I have examined for the presence of copper the potatoes which you sent to me for that purpose. I found that using 300 grammes weight of potatoes an almost infinitesimal trace of copper was detected. The quantity found was unweighable, and might have occurred in potatoes not specially treated with sulphate of copper. A much larger amount would be in no wise injurious to health.

I am, Sir,
Your obedient Servant,
(Signed) CHARLES A. CAMERON.

The Secretary,
Irish Land Commission.

Further experiments needed to determine certain points.

In his comments on the above experiments Mr. Franks, Secretary of the Irish Land Commission, states that it appears to be desirable that further experiments should be carried out to obtain information with respect to the following points which are of considerable importance to the practical agriculturist, viz :—

(1.) Should the potato plant be sprayed from above only, from below only, or both from above and below ?

(2.) Is it sufficient to thoroughly spray the potato plant once only, provided that the dressing be applied when the foliage is fully developed, and immediately before the earliest period at which the disease may be expected in the locality?

Experiments by Irish Land Commission.

(3.) How and in what form does the copper contained in the dressing find its way into the tissues of the foliage, and what length of time must elapse after the application of the dessing, in order that the copper may find its way into the tissues of the foliage to any considerable extent?

(4) Is the potato plant rendered practically disease-proof by the absorption of copper by the tissues of the leaf, even though the rain may have removed all traces of the dressing from the surface of the leaves?

The following is a copy of a circular issued by the Agricultural Department of the Irish Land Commission in June 1893:—

POTATO DISEASE.

Instructions for the Application of Sulphate of Copper and Lime Mixture to the Potato Plant for the prevention of Potato-Disease by the means of "Knapsack Sprayers."

Dates and mode of applying dressings.

1. The dressing should be applied about a fortnight before the earliest period at which disease has been known to make its appearance in the locality; the period of application in Ireland would therefore vary from the beginning of June in early districts to the latter end of July in late districts.

2. The dressing should be applied by means of a spraying machine, specially constructed for the purpose of throwing a fine mist-like spray, with which the foliage of the potato plant should be covered. Many spraying machines are sold, suitable for horse and hand power; the "Strawson" and "Éclair" knapsack sprayers, costing 35*s.* each, have proved very satisfactory; they can be worked by one man, and can be procured through any dealer in agricultural implements. Knapsack sprayers are the most suitable for use on small areas; the following instructions have been prepared on the assumption that such sprayers will be used.

PREPARATION OF THE MIXTURE.

Instructions for preparing dressings.

3. To prepare 25 gallons of the mixture, the quantity which one man can apply to an ordinary crop in three hours with a knapsack sprayer:—

(*a.*) Put twenty gallons of cold water into a wooden tub or cask, an empty paraffin barrel, with the head taken off, will suit admirably, and put five gallons of cold water into another vessel.

(*b.*) Take five pounds of powdered copper sulphate (if the copper sulphate is not powdered break it fine with a hammer); put the copper sulphate into a piece of coarse sacking, and suspend the sacking in the vessel containing 20 gallons of water so that the copper sulphate may readily dissolve in the water; the powdered copper sulphate should dissolve in about fifteen minutes; it may be stirred frequently to promote dissolution.

(*c.*) Put 2½ lbs. of freshly burned, pure, unslaked lime into a vessel, add sufficient water thereto from the vessel containing five gallons of water, to slake the lime; when the lime is thoroughly slaked add enough water from the five-gallon vessel to thoroughly cool the

Experiments in Ireland.

lime, thus producing a thin milk of lime, then pour any water remaining in the five-gallon vessel into the 20-gallon vessel containing the copper sulphate.

Experiments by Irish Land Commission

(*d.*) When the copper sulphate has been completely dissolved, stir it well with a stick and then pour the milk of lime slowly into the copper sulphate solution, stirring the whole continuously, and continue stirring for five minutes; the mixture should then appear azure-blue in colour; the mixture should then be allowed to rest for five minutes; after resting for five minutes the liquid should appear perfectly clear for a few inches in depth, the clearness of the liquid can be tested by holding a piece of white paper a few inches below the surface; if instead of appearing clear the liquid to the depth mentioned is slightly tinged with blue, slack four ounces of lime as before, add it to the mixture and stir thoroughly again, repeating this process if necessary until the upper portion of the liquid appears clear after having been allowed to rest for a few minutes, the mixture being then ready for use.

Proportions of ingredients.

4. Prepare whatever quantity of the above mixture may be required, using the ingredients in the following proportions, namely:—

20 lbs. of copper sulphate.
10 lbs. of lime.
100 gallons of water.

The copper sulphate may be left in solution for a considerable period, but the lime water should be freshly made and added to the copper sulphate solution immediately before use.

Application.

Application.

5. Stir the mixture thoroughly, then fill the cylinder of the knapsack sprayer, using a wooden or copper vessel for the purpose; the operator should then strap the machine on his back, and proceed to dress the crop, working the sprayer according to the directions sent out with each machine: the operator should walk slowly between the drills or lazy beds, and thoroughly spray the plants on each side from below and from above, pumping with one hand so as to maintain a steady pressure, and directing the nozzle with the other hand so as to throw the spray over every portion of the plants; if the foliage is very rank, meeting across the drills, the operator should walk backwards to avoid brushing the mixture off the plants with his clothes.

Important matters to be attended to.

6. *Important matters to be attended to:—*

1. Spray during dry weather, so that the mixture may remain on the foliage; if heavy rain falls within six hours after spraying, it would be desirable to spray again on the first favourable opportunity.
2. Use only pure copper sulphate, guaranteed to be of 98 per cent. purity; buy it powdered, or powder it before use; ordinary commercial sulphate of copper contains a large amount of sulphate of iron, and should not be used. Pure copper sulphate costs about 3*s.* per stone when purchased in small quantities, and can be obtained from the leading druggists.
3. If the sulphate of copper is impure, and contains much sulphate of iron, the mixture when prepared will appear greenish or brownish, instead of being deep azure-blue in colour.
4. Take care that the lime used is pure, well burnt, and unslacked.
5. Cold water should invariably be used in preparing the mixture; hot water should not be used. The lime, after being slacked, should be quite cool before being added to the copper sulphate solution; it may be cooled by adding cold water.

6. Iron vessels should not be used in preparing or handling the mixture, wooden or copper vessels should be used for such purposes.

Experiments by Irish Land Commission.

7. Empty paraffin barrels have been found very suitable for the preparation of the mixture; it will generally be found most convenient to prepare the mixture in the field in which it is to be used.

8. The mixture should be well stirred with a stick or piece of wood on each occasion before a fresh supply is drawn for the spraying machines.

9. The spraying machines should be oiled before being used: as there is a good deal of india-rubber in the working parts of the "Éclair," pure olive oil should be used for lubricating: ordinary machine oil should be avoided, as it frequently contains paraffin, which dissolves india-rubber.

10. One man attended by a boy can apply about nine or ten gallons of dressing with a knapsack spraying machine in one hour. One boy can attend three men using knapsack sprayers, carrying fresh supplies of dressing to them.

Quantity of dressing per acre.

11. The quantity of the mixture to be applied per acre is approximately as follows—the mixture when prepared costing about one halfpenny per gallon:—

	Per Statute Acre.	Per Irish Acre.
For an average crop of Champions with fully developed foliage	100 gallons	160 gallons
For a crop of Champions with more than the average amount of foliage	150 gallons	240 gallons
For a crop of Champions with a small development of foliage	80 gallons	130 gallons

12. When dressing potato plants which are very young, or of tender-leaved varieties, it would be desirable to weaken the mixture by the addition of one-third more water than the quantity specified in the instructions given above.

13. Sulphate of copper being a poison, the vessels in which the mixture is prepared should not afterwards be used for holding food or drink for animals.

Experiments carried out by the Agricultural Department of the Commissioners of National Education, Ireland.

Experiments by Commissioners of National Education, Ireland.

The experiments upon the potato which were carried out at the Albert Farm, Glasnevin, under the direction of the Agricultural Department of the Commissioners of National Education of Ireland in 1892, had for their object:—

1. Investigation as to the mode by which the disease *phytophthora infestans* reaches the tuber of the potato plant.
2. Measures for the prevention of, or for the lessening of the effects of the disease upon the crop.

EXPERIMENTS IN IRELAND.

Experiments by Commissioners of National Education.

Mr. Carroll states that in reports which he has previously written upon experiments made for testing preventives against disease, he has endeavoured to show that further investigation is desirable to ascertain by what means "the disease" is propagated, and he has to repeat his opinion that until exact knowledge of the life history of the *Phytophthora* is obtained, we shall continue to be working in the dark in trying remedial measures.

The "search light of science," he says, "is necessary to guide "practice in dealing with the important, but difficult question of "the proper mode of prevention of disease."

With the view towards helping on inquiry as to the means by which the potato tubers become affected by disease, the following experiments were carried out under the superintendence of Mr. Carroll at the Albert Farm, Glasnevin, and at the Garryhill Agricultural National School, county Carlow.

The point upon which light was sought was as to whether the disease-producing mycelium reached the tubers of the potato plant through the aerial and underground stems, or by means of the disease-producing spores falling upon the earth, and being washed through it to the surface of the tubers.

Mr. Carroll remarks, that for a long period he has inclined to the view held by those who support the theory that the disease reaches the tubers from without, *i.e.*, that the spores reach the immature tubers through being carried to them through the earth by water, and amongst the different theories propounded on this subject, he has already on different occasions felt constrained to express this opinion.

1. *Experiments as to the Propagation of the Potato-Disease.*

Experiments by Mr. Carroll as to propagation of the disease.

Mr. Carroll states that the experiments here noted are submitted with a due regard to the consideration that should be accorded to those who have given so much attention to plant diseases. He does not offer them as anything approaching a final solution of the question involved, nor does he claim for them any position but that of an *attempt* at investigation.

The experiment was carried out at the two stations upon similar lines, and at each place the Flounder, a variety of potato extremely liable to disease, was chosen for the experiment.

A portion of ground upon which these potatoes were growing was covered beneath the potato stems and leaves with a layer of cotton wool. This cotton wool was carefully placed around the stems, and every means was used to have the ground perfectly covered with it with the view of filtering out the spores that might fall upon the ground.

The cotton wool was put on in June, before any sign of disease was noticeable. Disease appeared in July, and the leaves of the potato plants were in each case badly affected.

Experiments by Commissioners of National Education.

Results.

Upon raising the potatoes in October, the following results were noticed:—

Albert Farm, Glasnevin.

Potatoes where ground was covered with cotton wool:—	
Sound potatoes - - -	75 tubers.
Diseased - - -	—
Potatoes where ground was uncovered:—	
Sound potatoes - - -	40 tubers.
Diseased - - -	33 „

Garryhill Agricultural National School.

Potatoes where ground was covered with cotton wool:—	
Sound tubers - - - -	95
Diseased - - - - -	—
Potatoes where ground was uncovered:—	
Sound tubers - - - -	61
Diseased - - - - -	15

These experiments, which were very carefully carried out, serve to indicate that the disease is carried to the tubers of the potato plant through the spores, which cause the disease, being taken through the earth to the tuber, and not by means of the mycelium finding its way to the tubers through the stem of the plant.

These experiments will be repeated in 1893.

2. *The Sulphate of Copper Remedy against Potato-Disease.*

Experiments with sulphate of copper.

Experiments similar to those of last year, on the use of sulphate of copper as a preventive of potato-disease, were carried out at the following stations:—

The Albert Farm, Glasnevin.

The Munster Agricultural School, Cork.

The Garryhill Agricultural National School, co. Carlow.

The Woodstock Agricultural National School, co. Kilkenny.

On the whole, it is stated, the details of these experiments serve to show that the judicious use of a solution of copper will very sensibly minimise the effects of the disease.

It appears that the success of the application of this remedy against potato-disease depends very materially upon—

(*a*) the remedy being applied at the proper time;

(*b*) the thoroughness of the dressing;

(*c*) the atmospheric conditions at the time of the application.

As regards the period at which the dressing, the composition of which is now generally known, should be applied, Mr. Carroll has frequently expressed the view that the disease once set in cannot be cured, and that the discovery of M. Girard must be relied upon solely as a preventive and not as a curative agent.

EXPERIMENTS IN IRELAND.

Experience of the use of these remedies during the past few years has, he considers, borne out this view.

Experiments by Commissioners of National Education.

He observes that it is probable that the film of copper solution which covers the leaves and stems of the potato causes the death of the disease-producing spores when they reach the leaves and stems, and that if it were possible to thoroughly coat over all parts of the potato plants with a film of this mixture the disease would be entirely prevented. He does not think that any experiment has shown that the copper solution can reach the mycelium within the plant structure. Indeed, he considers that the stage when the mycelium has formed within the tissues of the plant is a period almost too late for remedial measures.

Mr. Carroll points out that if these views be correct, then it follows that the preventive dressings should be applied some time previously to the appearance of the disease, and that every effort should be made to thoroughly coat over the potato plants; and as regards the atmospheric conditions, it follows that if rain should interfere with the dressing, further applications should be made until the plants retain the necessary coating of the dressing of hydrated oxide of copper.

Expense of dressings must be lessened.

In his concluding remarks Mr. Carroll states that, if further experience in the use of these copper dressings proves their effectiveness, some means must be found for lessening expense in their use.

An experiment, having for its object the testing of the effect of removing the stalks of potatoes upon the appearance of disease with the view of preventing the tubers from being affected, was carried out at the Ballacutranta School Farm, Co, Sligo.

Removal of potato haulm to prevent disease.

The system of removing the potato haulm upon the appearance of the disease has frequently been recommended as a preventive.

During the month of August the potato-disease was fairly active in the County Sligo; and in this month at the Ballacutranta Agricultural National School, two plots of ground bearing a crop of potatoes were marked out for experiment. On one the stalks were removed. On the other they were allowed to remain.

Early in November the potatoes were lifted, and the weights were found to be as follows:—

Crop where stalks were removed, 58 lbs.
Crop where stalks were not removed, 73½ lbs.

The amount of diseased tubers was practically the same in both cases.

Where stalks were removed, 6½ lbs.
Stalks not removed, 6 lbs.

No benefit by removal of haulm.

This experiment, it is remarked, serves to show that, through the removal of the potato haulm before the crop was matured, the

yield of crop was lessened without commensurate benefit in freedom from disease.

Experiments by Commissioners of National Education.

Experiments at the Albert Model Farm, Glasnevin.

For the purpose of this experiment a field was taken in which were growing three varieties of potatoes.

Dressings used at Albert Model Farm.

The following dressings were applied on 14th July :—

Dressing No. 1, 5 lbs. sulphate of copper.
5 lbs. quick lime.
5 lbs. treacle.
25 gallons water.
(For one rood.)

Dressing No. 2, 5 lbs. sulphate of copper.
5 lbs. quick lime.
25 gallons water.
(For one rood.)

Dressing No. 3, 11 lbs. sulphate of copper.
5½ lbs. quick lime.
25 gallons water.
(For one rood.)

Dressing No. 4, 5½ lbs. sulphate of copper.
2¾ lbs. quick lime.
27½ gallons water.
(For one rood.)

The mode of application of these mixtures known as bouillie bordelaise, was by the sprayers, Eclair and Pilter-Bourdil, the former by far the better machine for the purpose.

Results of treatment.

The potatoes were raised on 6th October, and the following table shows the result:—

Variety.	Dressing No. 1.		Dressing No. 2.	
	Sound.	Diseased.	Sound.	Diseased.
Champion - - -	T. c. q. lbs. 11 3 0 23	T. c. q. lbs. 1 0 1 3	T. c. q. lbs. 10 16 1 27	Nil.
Percentage - - -	91·7	8·3	—	—
Irish Whites - - -	3 0 3 14	Nil.	5 8 0 25	Nil.
Percentage - - -	—	—	—	—
Bruce - - - -	11 9 3 25	Nil.	10 16 1 27	Nil.
Percentage - - -	—	—	—	—
Average per acre - -	8 11 1 11	Nil.	9 0 1 9½	Nil.
Percentage of disease -	—	9·08	—	3·12

EXPERIMENTS IN IRELAND.

Experiments by Commissioners of National Education.

Variety.	Dressing No. 3.		Dressing No. 4.		No Dressing.	
	Sound.	Diseased.	Sound.	Diseased.	Sound.	Diseased.
Champion -	T. c. q. lbs. 10 16 1 27	T. c. q. lbs. 0 6 3 1	T. c. q. lbs. 8 15 3 10	Nil.	T. c. q. lbs. 10 16 2 9	Nil.
Percentage -	97·0	3·0	—	—	—	—
Irish Whites -	3 14 1 17	Nil.	3 6 3 14	Nil.	5 8 1 13	Nil.
Percentage -	—	—	—	—	—	—
Bruce - -	10 19 3 13	Nil.	4 1 0 18	Nil.	9 19 2 4	Nil.
Percentage -	—	—	—	—	—	—
Average per acre	8 10 1 0½	Nil.	5 5 3 23½	Nil.	8 18 0 18	Nil.
Percentage of disease.	—	—	—	—	—	—

EXPERIMENT No. 2.

Result of experiment on variety liable to disease.

This experiment was carried out with a view of testing the efficacy of sulphate of copper in saving from disease a variety of potatoes (Kemps) extensively grown in this country, and liable to disease.

Ten drills, 21 feet long and 28 inches wide, were selected for the purpose and dressed with mixtures similar to those applied on the farm and numbered 1, 2, 3, and 4.

The dressing was applied on 15th July and the crop was raised on the 6th October 1892.

Variety.	Dressing No. 1.		Dressing No. 2.		Dressing No. 3.		Dressing No. 4.		No Dressing.	
	Sound.	Diseased.	Sound.	Diseased.	Sound.	Diseased.	Sound.	Diseased.	Sound.	Diseased.
Kemp (early Scotch).	St. lb. 3 5	St. lb. 2 1	St. lb. 3 1	St. lb. 2 2	St. lb. 4 1	St. lb. 1 8	St. lb. 3 13	St. lb. 1 10	St. lb. 2 2	St. lb. 3 3
Percentage diseased.	—	38·13	—	41·09	—	27·84	—	30·38	—	60·0

Experiments at the Munster Agricultural School, Cork.

Experiments at Munster Agricultural School.

The solutions used in these experiments were :—

(1.) 20 lbs. sulphate of copper per acre.
20 lbs. quick lime per acre.
100 gallons water per acre.
20 lbs. treacle per acre.

(2.) As above without treacle.

(3.) 44 lbs. sulphate of copper per acre.
22 lbs. quick lime per acre.
220 gallons water per acre.

(4.) 6 lbs. sulphate of copper per acre.
6 lbs. quick lime per acre.
100 gallons water per acre.

Experiments by Commissioners of National Education.

Three sets of plots A, B, C, were dressed, 12 in all, A and B merely duplicates; on the C plots the dressing was repeated after 10 days. When the solutions were sprayed over the crop on the 19th July, there was just perceptible on the foliage a few small spots of disease. It made little progress over the crop until rain set in on the 6th August. Then it spread rapidly blackening the foliage, but not so quickly on the dressed plots. However, the decay was not arrested so long as to influence the amount of the crop. Each plot for comparison was $\frac{1}{56}$ acre, an equal space undressed was left beside each plot for comparison. As shown in the following table the dressing appears to have been at least slightly effective in each case. No doubt a dressing before the appearance of the disease would tell better, or perhaps in larger plots; for the tubers on the dressed plots were quite accesible to the spores from the undressed foliage on each side. The experiment was tried only on the Champion variety.

Results at Munster School.

The results are as follows:—

	Dressed Plots.		Undressed Plots.	
	Cwts. per Acre.		Cwts. per Acre.	
	Sound.	Diseased.	Sound.	Diseased.
A Set.				
Solution No. 1 - -	193	12	199	15
Per-centage	94·1	5·9	92·9	7·1
Solution No. 2 - -	193	10	205	18
Per-centage -	95·0	5·0	91·9	8·1
Solution No. 3 - -	211	22	203	27
Per-centage -	90·5	9·5	88·3	11·7
Solution No. 4 - -	169	8	193	11
Per-centage -	95·5	4·5	94·6	5·4
Average - -	93·78	6·22	91·9	8·1
B Set.				
Solution No. 1 - -	208	9	157	21
Per-centage -	95·8	4·2	88·2	11·8
Solution No. 2 - -	160	16	187	21
Per-centage -	90·9	9·1	89·9	10·1
Solution No. 3 - -	174	15	138	13
Per-centage -	92·1	7·9	91·4	8·6
Solution No. 4 - -	174	12	155	18
Per-centage -	93·5	6·5	89·6	10·4
Average - -	93·1	6·9	89·8	10·2

EXPERIMENTS IN IRELAND.

Experiments by Commissioners of National Education.

	Dressed Plots.		Undressed Plots.	
	Cwts. per Acre.		Cwts. per Acre.	
	Sound.	Diseased.	Sound.	Diseased.
C Set.				
Solution No. 1 - -	188	11	179	20
Per-centage -	94·5	5·5	90·0	10·0
Solution No. 2 - -	170	16	148	22
Per-centage -	91·4	8·6	87·2	12·8
Solution No. 3 - -	164	17	152	35
Per-centage -	90·6	9·4	81·3	18·7
Solution No. 4 - -	193	17	188	24
Per-centage -	91·9	8·1	88·7	11·3
Average - -	92·1	7·9	86·8	13·2

From this table it appears the second dressing had an appreciable effect, as on the C plot the per-centage of the crop saved by the dressings was 5·3, and on the A and B plot dressed once it was 2·6.

The following table shows the average per-centage of the three plots to which each solution was applied, and for the adjoining undressed plots:—

	Dressed.		Not Dressed.		Difference.
	Sound.	Diseased.	Sound.	Diseased.	
Solution No. 1 -	94·8	5·2	90·4	9·6	4·4
" " 2 - -	93·3	6·7	89·6	10·4	3·7
" " 3 -	91·1	8·9	87·0	13·0	4·1
" " 4 - -	92·8	7·2	91·1	8·9	1·7
Average -	93·0	7·0	89·5	10·5	3·5

It is remarked that though a conclusion cannot safely be drawn in the absence of more decisive results, it may be noted that solutions (1) and (3) appear equally effective, while (4) appears insufficient.

Experiments at the Garryhill Agricultural N. School, County Carlow.

Experiments at Garryhill Agricultural N. School.

The potato crop on this farm in 1892 was subjected to dressings of sulphate of copper and lime. The results bear out the conclusions of previous years, viz., that the application is ineffective

Experiments by Commissioners of National Education.

in preventing the disease reaching the tubers, but as it keeps the plants growing for a fortnight after the disease has killed those undressed it is highly beneficial in increasing the weight of produce. As the tubers have thus time to mature it is very probable that their nutritive qualities are also improved.

One dressing (No. 1) consisted of a mixture of 44 lbs. sulphate of copper, 22 lbs. lime and 220 gallons of water per acre.

No. 2 dressing consisted of a mixture of 20 lbs. sulphate of copper, 20 lbs. lime, and 100 gallons water, per acre.

Separate plots were treated, and the application was made on 23rd July 1892. The following are the results:—

—	Total Produce per Acre.		Diseased.	
	Tons.	Cwts.	Cwts.	Qrs.
No. 1 dressing - - -	15	8	15	2
Percentage diseased - - -		—	5	
No. 2 dressing - - - -	14	12	10	1
Percentage diseased - - -		—	3·5	
Undressed plot - - -	12	11	10	1
Percentage diseased - - -		—	4	

Another plot in which treacle was employed in the mixture shows nothing special in favour of its use.

By direction of Mr. Carroll a thick layer of cotton wool was so placed as to completely cover the earth without checking the growth of the plants which were brought through openings in the cotton wool.

When digging out, 95 tubers were found in the drills so treated, all sound. A similar length of drills in same plot was then dug with the result that of 76 tubers, 15 were diseased. This, it is observed, seems to support the theory that the disease is carried down by rain to the tubers, the spores having fallen off the leaves, and not, as generally believed, that the disease is brought down through the stalk. It points to the advantage of high moulding, a layer of earth of sufficient thickness to filter the rain water, as it descends through the earth, being apparently what is required to protect the tubers.

Experiments at the Woodstock Agricultural N. School, County Kilkenny.

Experiments at Woodstock Agricultural School.

The following dressings were applied on 18th July 1892:—

Dressing No. 1.—5 lbs. sulphate of copper - }
5 „ quicklime - - } Per rood.
5 „ treacle - - }
25 gallons of water - }

Dressing No. 2.—5 lbs. sulphate of copper - }
5 „ quicklime - - } „
25 gallons of water - }

EXPERIMENTS IN IRELAND.

Experiments by Commissioners of National Education.

Dressing No. 3.—11 lbs. sulphate of copper - }
5½ „ quicklime - - } Per rood.
55 gallons of water - }

Dressing No. 4.—5½ lbs. sulphate of copper - }
2¾ „ quicklime - - } „
27½ gallons of water - }

The potatoes were raised on 10th October, and the following table shows the result:—

Dressing No. 1.			Dressing No. 2.		
Marketable.	Small.	Diseased.	Marketable.	Small.	Diseased.
T. c.	T. c.	T. c.	T. c.	T. c.	T. c.
9 10	0 13	0 7	8 12	0 15	0 13
Percentage diseased, 3·4.			Percentage diseased, 6·4.		

Dressing No. 3.			Dressing No. 4.			No Dressing.		
Marketable.	Small.	Diseased.	Marketable.	Small.	Diseased.	Marketable.	Small.	Diseased.
T. c.	T. c.	T. c.	T. c.	T. c.	T. c.	T. c.	T. c.	T. c.
9 6	1 3	0 6	9 0	0 17¾	0 11¾	8 0	1 5	0 15
Percentage diseased, 2·8.			Percentage diseased, 5·6.			Percentage diseased, 7·5.		

It appears that all the above mixtures are decidedly beneficial. In comparing this year's (1892) experiment with that of last year, it should be noted that last year's dressing was not applied until four days after the crop had been attacked by the blight, while this year the crop was quite unblighted at the date of dressing.

In 1891 the difference in colour between the dressed and undressed portions of the crop was not quite discernible; but in 1892 this difference was marked, and held up to the date of lifting.

PART II.

EXPERIMENTS

IN

CHECKING POTATO DISEASE

IN

FOREIGN COUNTRIES.

PART II.

Experiments in Checking Potato Disease in Foreign Countries.

BELGIUM.

Experiments at Gembloux.

M. Petermann's experiments.

The Board have received the detailed report of the results of M. Petermann's experiments at Gembloux in 1891, of which a short summary was published in their Report on Experiments in Checking Potato-disease, 1892, (C. 6647). These experiments were devised to ascertain the most suitable period for applying the preventive and curative treatment with copper dressings, and to determine the value of the bouillie with an iron base, and the dressing known as sulpho-sucrate of copper.

The experiments were conducted on a field with a deep sandy soil in good tilth parcelled out into plots of 11·96 square yards separated by a space of 7·75 square inches. All the experiments were made in duplicate. The manure consisted of about 176 lbs. of nitrate of soda, 440 lbs. of dephosphorated scoria, and 440 lbs. of kainit, per acre. Whole tubers of a variety known as Jeffe were used as seed, the average weight being 2·54 ozs.

The seed was planted on 8th May and the plants began to rise in due course. The bouillie bordelaise was applied in the form of 44 lbs. of crystalised sulphate of copper, 22 lbs. of quicklime, and 220 gallons of water per acre. The sulpho-sucrate of copper of M. Perret was used in the following proportions:—44 lbs. of sulphate of copper, 88 lbs. of lime in form of thin paste, 44 lbs. of molasses and 220 gallons of water per acre.

The lime and molasses were first diluted in four-fifths of the total quantity of water, and to this mixture was added the sulphate of copper which was first partly dissolved in the remaining one-fifth of the water.

The latter preparation is more viscous than the ordinary dressings. This causes a better suspension of the precipitate, which renders unnecessary the constant stirring of the liquid, and ensures a closer and more protracted adhesion to the leaves.

The first or preventive application of the dressings was made on 10th July.

BELGIUM.

M. Petermann's experiments.

On July 16th the first signs of the disease were apparent. The curative application was carried out on July 18th.

The excessively wet weather (the rain-gauge of the agricultural station registered from 10th July to 22nd September 5·7 inches of rain) which prevailed in the summer of 1891, provoked a rapid development of the disease.

By the middle of August the plots which had not been treated exhibited symptoms of a violent attack of the disease, while those which had been treated, especially those dressed with the sulpho-sucrated bouillie, could be distinguished from afar by their greenness.

An interval of dry weather from 4th to 14th of September somewhat arrested the ravages of the *phytophthora*.

Results.

The potatoes were harvested on the 22nd of September, and the average results per acre were as under :—

	Total yield per Acre.	Tubers.	
		Sound.	Diseased.
	Tons.	Tons.	Tons.
Control plot, no treatment - - -	9·1017	7·2925	1·8092
Bouillie bordelaise curative treatment -	10·4139	8·9685	1·4454
Bouillie bordelaise half preventive, half curative.	11·0283	8·6743	2·3540
Sulpho-sucrate of copper curative* -	10·2887	9·4795	0·8092
Sulpho-sucrate of copper, half curative, half preventive.	10·6326	9·1852	1·4474

* Sulpho-sucrate of copper is a mixture of molasses, lime, and sulphate of copper.

Effect on starch in tubers.

The richness in starch of the seed tubers was 19 per cent., but the potatoes harvested did not reach this standard, nevertheless those from the treated plots were richer than those from the untreated plot, as will be seen from the following statement of the percentage of starch :—

	Per cent.
Bouillie bordelaise :—	
Curative treatment - - - -	17·5
Half curative treatment, half preventive -	17·5
Sulpho-sucrate of copper :—	
Curative treatment - - - -	18·3
Half curative treatment, half preventive -	18·4
Control plot - - - -	16·8

On examining the foregoing table, it will be observed that the application of the copper dressings had a significant effect on the total yield of tubers (healthy and diseased). The increase in the

gross yield from the plots dressed with bouillie bordelaise and sulpho-sucrate of copper, respectively compared with the crop from the untreated or control plot, is shown below.

M. Petermann's experiments.

	Tons.
Bouillie bordelaise :—	
Curative treatment - - - -	1·3122
Half curative treatment, half preventive -	1·9266
Sulpho-sucrate of copper :—	
Curative treatment - - - -	1·1870
Half curative treatment, half preventive -	1·5309

M. Petermann remarks that it cannot for a moment be admitted that this augmentation of the crop is due to the fertilizing action of the lime or the sulphate of copper, which had acted in the soil as the agents of diffusion or of absorption of the carbonate of ammonia of the atmosphere, but it is to be explained solely by the more complete and prolonged preservation of the leaves, the organs of evaporation, a feature which he has observed throughout his three years' experiments.

Injurious effects of fungus exhibited in two ways.

He points out that it is known that the injurious effects of the *phytophthora* are exhibited in two ways (*a*) by a diminution of the production of organic substances by the destruction of the leaves, (*b*) by the infection of the tubers, by spores falling upon the soil, or by the mycelium spreading in the interior of the plant. Consequently, the salts of copper in destroying the fungus, or at least diminishing the vitality, exercise a beneficial influence, not only reducing the risk of infection of the tubers, but also in prolonging the duration of activity of the chlorophyll.

M. Petermann says, that on examining under a magnifying glass leaves freshly attacked with the disease, it is seen in a hot and humid season how rapid is the extension from the first point of attack, which is soon followed by the complete invasion of the whole leaf, together with the destruction of the cellular tissue and the disappearance of the chlorophyll.

While, on the other hand, by carefully raising with the aid of slightly acidulated water, the coating of hydrated oxide of copper from a leaf which has been properly treated, the disease is found to be arrested at the centre of attack, and the remainder of the leaf is perfectly sound. A microscopical examination of the portion attacked shows that the fresh formation of spores has entirely ceased.

He adds that the prolongation of functions of the chlorophyll is manifested not only by the increase of the yield, but also by an augmentation of the richness in starch. The same fact was observed in 1891 by M. De Vuyst at Borsbeke-lez-Alost, who found the average richness in starch of 17 varieties on the dressed plots to be 17·05 per cent., while on the untreated plots it was 15·9 per cent.

Considering the results of his experiments from a purely practical point of view, M. Petermann states that the proper

BELGIUM.

M. Petermann's experiments.

application of copper dressings represents a considerable profit per acre in years when the disease is prevalent, as shown below.

Results.

Average results of two Experiments.

—	Yield of Healthy Tubers.	Value of Crop at 48/10 per ton.	Gross Profit.	Expenses of Treatment.	Net Profit.
	Tons.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Control plot - -	7·2925	17 16 1	—	—	—
Bouillie bordelaise* -	8·8214	21 10 9	3 14 8	0 14 7	3 0 1
Sulpho-sucrate of copper.*	9·3323	22 15 9	4 19 8	0 16 2	4 3 6

* Average of two modes of application.

As in preceding years attempts were made to discover traces of copper in the parings and the flesh of washed tubers which had been taken from plots submitted to the copper treatment, and many other samples sent to Dr. Petermann were similarly examined, but the results were negative in all cases.

Dr. Petermann's conclusions.

Dr. Petermann's conclusions from the experiment carried out at the agricultural station at Gembloux during 1889, 1890, and 1891, are as follows:—

The treatment with bouillie bordelaise (ordinary) or of bouillie with molasses, constitutes an efficacious procedure for the material reduction of the injurious effects caused by the *phytophthora*.

The beneficial action of the remedy is manifested not only by an increase of the entire yield and of the yield of healthy tubers, but also by an increase of starch.

The treatment is practical and produces a much more beneficial result when it is applied to varieties more subject to disease, and under meteorological conditions of humidity and heat more favourable to the development of the parasite.

Washed tubers are free from copper.

The curative treatment applied at the moment when the disease first manifested itself has proved superior to the preventive treatment, that is to say, to the treatment carried out before the disease has appeared.

Nevertheless in practice, the half preventive, half curative treatment is recommended because the determination of the period of the first outbreak of disease demands continuous supervision and much experience, and it is more difficult to determine upon a large area.

EXPERIMENTS IN THE CAMPINE DISTRICT.

Experiments in Campine district.

In the Belgian "Bulletin de l'Agriculture," 1892 (Vol. VIII.), No. 1, there is a report of experiments in the Campine District to observe the efficacy of bouillie bordelaise and sulpho-steatite of copper on the potato-disease, from which the following notes have been taken :—

1. An experimental field was selected at Neeroeteren. The first application of bouillie bordelaise and sulpho-steatite of copper was made on the 29th June, and the second on the 1st August. The bouillie used was of the ordinary strength.

The sulpho-steatite was applied by means of bellows at the rate of 26¾ lbs. per acre. The varieties of potatoes treated were the Red of Campine and the Rykmakers, the first of which was not attacked by the disease. The following table shows the results obtained as regards the Rykmakers variety :—

Rykmakers Variety.	Control Plot (3·9 perches).	Plot dressed with Bouillie Bordelaise (3·9 perches).	Control Plot (3·9 perches).	Plot dressed with Sulpho-steatite of copper (3·9 perches).	Control Plot (3·9 perches).
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Healthy tubers -	480	539	519	563	585
Diseased tubers -	13	22	22	13	17

From these figures the effect appears to have been nil. The only conclusion that can be drawn is that the bouillie bordelaise or sulpho-steatite treatment did not diminish the yield.

Effects "Nil."

2. A second experimental field was established at Vieux-Joncs in a clayey soil. The first treatment was made on the 27th June, the second on the 30th July. The varieties experimented on were the "My Lord" and the "Saxony."

The results obtained are shown in the following table :—

	Control Plot (3·9 perches).	Plot dressed with Bouillie Bordelaise (3·9 perches).	Plot dressed with Sulpho-steatite of copper (3·9 perches).
	Lbs.	Lbs.	Lbs.
My Lord { Healthy tubers -	460	411	414
My Lord { Diseased tubers -	8·8	6·6	4·4
Saxony - { Healthy tubers -	475	479	484
Saxony - { Diseased tubers -	31	35	20

BELGIUM.

Experiments in Campine district.

In the experiment with the "My Lord" variety, the plots treated with bouillie bordelaise and sulpho-steatite yielded less diseased tubers than the control plot, but this plot gave a larger yield of healthy potatoes than the others.

In the experiment with the "Saxony" the first plot gave less diseased tubers than the second, whilst the latter gave a larger yield of sound tubers. The third plot gave the largest yield of healthy and the least of diseased tubers.

3. A third field was established at Bree. The potatoes were first treated on the 30th June, and again on the 7th August. The varieties planted were the "Red of Campine" and the "Rykmakers." The results were as follows:—

		Control Plot (3·9 perches).	Bouillie Bordelaise Plot (3·9 perches).	Sulpho-steatite Plot (3·9 perches).
		Lbs.	Lbs.	Lbs.
Red of Campine	Healthy tubers -	574	576	576
	Diseased tubers -	11	9	10
Rykmakers	Healthy tubers -	444	451	452
	Diseased tubers -	21	20	19·8

Results inconclusive.

The bouillie, as well as the sulpho-steatite, appears to have increased the yield, but the difference between each plot is too slight to draw any conclusions.

Further experiments in Campine district.

The following is a summary of a report from the Belgian "Bulletin de l'Agriculture" relative to some further experiments made in the Campine district of Belgium in 1891.

The potato-disease was not very prevalent in the Campine district in 1891, where, as a rule, it is less severe and appears later in the sandy than in the clay soils.

Four different experiments were conducted on private farms, and the results are tabulated below. The dressings used were:—

(*a.*) Bouillie bordelaise, made by adding 20 lbs. of sulphate o copper and 15 lbs. of lime to 100 gallons of water. This was applied at intervals and in varying quantity, 70 to 110 gallons per acre, according to the development of the foliage.

(*b.*) Sulpho-steatite of copper, at the rate of 26¾ to 35¼ lbs. per acre, also applied at intervals.

Further experiments in Campine district.

Experiment 1. Area of each plot: 29·9 square yards.
Two applications made, 1st July and 3rd August.

Name of Variety.	Plot.	Preventive Treatment.	Weight of Sound Tubers per Acre.	Weight of Diseased Tubers per Acre.
			Tons.	Lbs.
Mealy red	1	Sulpho-steatite	10·0009	—
	2	Bouillie bordelaise	8·2834	—
	3	None	10·1816	77
Juno	1	Sulpho-steatite	10·6994	—
	2	Bouillie bordelaise	8·5423	—
	3	None	8·8884	—
Andersen	1	Sulpho-steatite	8·2834	—
	2	Bouillie bordelaise	8·4560	—
	3	None	8·4560	—
Magnum Bonum	1	Sulpho-steatite	7·8826	—
	2	Bouillie bordelaise	9·4012	—
	3	None	8·1109	—
Red of Campine	1	Sulpho-steatite	6·7309	44
	2	Bouillie bordelaise	5·6948	62
	3	None	5·4361	88

The *phytophthora infestans* caused little or no damage. The Red of Campine suffered from the attacks of the larva of a beetle. The treatment had no injurious action on the foliage.

No injury to foliage from dressing.

Experiment 2. Area of each plot: 29·9 square yards.
Two applications made, 10th July and 4th August.

Name of Variety.	Plot.	Preventive Treatment.	Weight of Sound Tubers per Acre.	Weight of Diseased Tubers per Acre.
			Tons.	Lbs.
Blauputters	1	Sulpho-steatite	6·6756	99
	2	Bouillie bordelaise	8·7546	199
	3	None	7·1545	159
"	4	Bouillie bordelaise	6·0289	161
	5	None	6·0050	159
"	6	Bouillie bordelaise	5·8364	199
	7	None	4·8952	398
"	8	Bouillie bordelaise	7·7192	299
	9	None	4·8948	198

The foliage on the plots treated with bouillie bordelaise remained green longer than that on the others. These plots also yielded tubers of larger size, but not more numerous.

Dressed foliage remained green longer.

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Further experiments in Campine district.

Experiment 3. Area of each plot: 13·1 square yards (except the first, the area of which was 11·4 square yards).

Two applications made, 3rd July and 4th August.

Name of Variety.	Plot.	Preventive Treatment.	Weight of Sound Tubers per Acre.	Weight of Diseased Tubers per Acre.
			Tons.	Lbs.
Red of Campine	1	Bouillie bordelaise	7·3271	—
	2	None	6·4897	—
Anderssen	1	Bouillie bordelaise	6·3251	—
	2	None	6·5005	—
Juno	1	Bouillie bordelaise	9·7590	—
	2	None	9·2166	—
Magnum Bonum	1	Bouillie bordelaise	7·1382	—
	2	None	7·1382	—
Mealy Red	1	Bouillie bordelaise	10·8433	—
	2	None	9·7590	—

No difference between treated and untreated plots.

No difference was observed between the foliage of the treated and untreated plots.

Experiment 4. Area of each plot: 29·9 square yards.

Two applications made, 20th July and 10th August.

Name of Variety.	Plot.	Preventive Treatment.	Weight of Sound Tubers per Acre.	Weight of Diseased Tubers per Acre.
			Tons.	Lbs.
Magnum Bonum	1	Sulpho-steatite	6·4666	—
	2	Bouillie bordelaise	7·2957	—
	3	None	6·5497	—
„	4	Sulpho-steatite	7·6273	—
	5	Boullie bordelaise	7·3036	—
	6	None	6·5504	—
„	7	Sulpho-steatite	7·1299	—
	8	Bouillie bordelaise	7·9590	—
	9	None	7·3788	—
„	10	Sulpho-steatite	7·1390	—
	11	Bouillie bordelaise	7·1728	—
	12	None	5·6968	—
„	13	Sulpho-steatite	6·4666	—
	14	Bouillie bordelaise	8·3016	—
	15	None	5·0335	—

Dressed foliage remained green.

The foliage on the plots treated with bouillie bordelaise remained green longer than that on the others.

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M. Girard's Experiments.

M. Aimé Girard has been good enough to transmit to the Board a copy of a paper, read by him before the National Agricultural Society of France on the 25th May 1892, on the results of his observations and experiments of 1891.

M. Girard states that the losses caused to French agriculture by the potato-disease were much less than usual in 1891, owing, partly to the weather, and partly to the more extended use of copper dressings, the efficacy of which can now be said to be beyond contradiction. During the 1891 season it was arranged with 350 farmers in different parts of France to make extended observations both as regard the progress and the prevention of the disease. The results show that only 41 per cent. of the area under observation was attacked, whilst owing to the extended cultivation of the Richter's Imperator, which is a disease-resisting variety, the attack was very slight in many instances. Two hundred careful observations were made, the results of which are shown below :—

200 observations made.

Regions of the Agricultural Department.	No. of Areas under Observation.	No. of Areas Attacked.	Percentage Attacked.
			Per cent.
North-west	24	13	54
North	45	26	58
North-east	31	10	32
West	30	7	24
Midlands	25	9	36
East	20	12	60
South-west	14	3	21
South	8	2	25
South-east	3	—	—
	200	82	41

From the above table it will be seen that only three regions seriously suffered from the disease. In four departments in the north region 75 per cent. of the area under observation was attacked, whilst in the "Pas de Calais" the proportion attacked reached 77 per cent.

In the North-east, where the disease is generally very severe, the attack was slight.

The attack was also slight in the West and Midlands, as well as in the south where the potato is not widely cultivated.

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M. Girard's experiments.

The areas from which observations were taken are classified by M. Girard as follows :—

Areas not attacked	1. Not treated	- - -	77
	2. Treated	- - -	41
			118
Areas attacked	1. Not treated	- - -	9
	2. Treated	- - -	73
			82
			200

As regards the areas attacked, only nine cultivators neglected to use the bouillie bordelaise and their crops greatly suffered. Whereas the mean yield per acre of potatoes in France in 1891 was 14·31 tons, these nine untreated areas gave only 10·30, 9·94, 9·14, 8·75, 8·75, 8·47, 8·35, 7·95, and 7·15 tons respectively. Had the variety grown been a less resisting one than Richter's Imperator, the result would, it is stated, have been still more striking.

Of 73 dressings only five failed.

Of the 73 growers who, by using the copper sulphate treatment, aimed at preventing a diminution of their crop, 68 were entirely successful and only five failed. Of the five failures, however, four were clearly due to the insufficient quantity of solution used, and thus in one case alone, although two successive treatments were applied, did the remedy fail.

The following table gives the results of an experiment at Clichy-sous-Bois, where the disease was of considerable intensity. Four varieties of potatoes were planted in parallel plots under similar conditions, two thirds of each plot being sprayed, and the remaining third left as a control plot.

Experiment at Clichy-sous-Bois.

Variety.	Area Sprayed. 7·9 Perches.			Area Unsprayed. 7·9 Perches.		
	Total Weight of Crop.	Diseased.		Total Weight of Crop.	Diseased.	
		Weight.	Per Cent.		Weight.	Per Cent.
	Lbs.	Lbs.	%	Lbs.	Lbs.	%
Jeurey - -	1,449	5·1	0·35	1,275	190·7	14·9
Gelbe Rose - -	1,529	2·2	0·14	1,465	178·0	12·8
Red Skinned -	1,582	2·2	0·13	1,426	30·0	2·1
Richter's Imperator	2,004	2·0	0·09	1,698	40·0	2·4

For purposes of comparison the yield of the unsprayed plots has been calculated on the same area as that of the sprayed plots.

Bouillie of copper and soda used.

The dressing used was the bouillie of copper and soda, consisting of 20 lbs. of sulphate of copper, 30 lbs. of soda crystals, to 100 gallons of water, and from the above table its efficacy is self-evident. The disease had only a slight effect on such disease-resisting varieties as Red Skinned and Richter's Imperator bu

the difference between the sprayed and unsprayed plots of Jeuxey and Gelbe Rose was very striking.

M. Girard's experiments.

Most of the observers used the copper and lime dressing, the majority giving one treatment only. In 64 cases out of 100 one treatment properly applied proved sufficient.

As regards the cost of treatment, M. Girard remarks that, even in a season when the disease is not severe, it pays to spray.

It has long been observed that some varieties of potatoes resist the disease more than others. In the experiments of 1890 Richter's Imperator was observed to possess disease-resisting qualities in a high degree, and this observation was confirmed in 1891. In one instance there was only 1 per cent. of this variety diseased, whereas two other varieties had 25 per cent. to 30 per cent. attacked.

Diminution of yield in some instances.

In 1889 and 1890 it was noticed that the application of the dressing increased the yield, the increase being 41 per cent., in an experiment with the Jeuxey variety. On the other hand there were instances where the yield was diminished. Careful observations were therefore made on this point in 1891.

The following figures give the increase in weight of the yield of a treated plot of 7·9 perches over one of a similar size which was not treated :—

Variety.	Increase.	
	In Weight.	Per Cent.
	Lbs.	%
Jeuxey	359	33·1
Gelbe Rose	240	18·6
Red Skinned	185	13·2
Richter's Imperator	321	19·3

Increased yield of Richter's Imperator.

The following nine cases show the increase of yield of Richter's Imperator by the treatment :—

	Yield of Crop on		Increase of Yield through the Treatment.	
	3·9 Perches, Treated.	3·9 Perches, Not Treated.	In Weight.	Per Cent.
	Lbs.	Lbs.	Lbs.	%
1.	1,012	704	308	43
2.	682	506	176	34
3.	1,071	748	323	43
4.	748	506	242	47
5.	970	537	433	80
6.	713	616	97	15
7.	845	594	251	40
8.	704	627	77	12
9.	770	550	220	40

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M. Girard's experiments.

As regards the diminution of yield by the treatment, the experiment at Joinville-le-Pont may be mentioned, where in 1891 the disease was very slight. There 32 varieties of potatoes were cultivated experimentally, and the results were very marked. The 16 non-resisting varieties gained from 1·2 to 20·7 per cent. by the treatment, whilst the disease-resisting varieties lost from 4 to 8 per cent. of their yield. In one case (but an error is suspected) there was a diminution in yield of 27 per cent.

In nearly every instance, however, an analysis of the tubers has shown an increase of about 1 per cent. of starch.

M. Girard's conclusions.

The following are the conclusions arrived at by M. Girard on this point:—

1. When a field is badly attacked by the disease, the weight of the crop on the dressed plots is always greater than on the undressed plots.
2. When, on the contrary, the field is not attacked by the disease, certain disease-resisting varieties yield a slightly diminished crop by the treatment, from 5 to 6 per cent. as a rule.

Experiments with disease-resisting varieties.

It would seem therefore as though it were best to leave the resisting varieties alone. It might be so if one was certain that the potatoes would not be attacked, or only slightly. But to show that it is best always to use the treatment the result of two observations made in 1891 are recorded by M. Girard as follows:—

Joinville-le-Pont.

1. At Joinville-le-Pont, in a porous soil, where the disease was very slight.

Disease-resisting Varieties.	Dressed Plot. 3·9 Perches.			Undressed Plot. 3·9 Perches.			Decrease of Yield by the Treatment.	
	Total weight of Crop.	Diseased.		Total weight of Crop.	Diseased.			
		Weight.	Per cent.		Weight.	Per cent.	Weight.	Per cent.
	Lbs.	Lbs.	%	Lbs.	Lbs.	%	Lbs.	%
Richter's Imperator -	715	Nil.	Nil.	748	Nil.	Nil.	33	4·4
Red Skinned - -	543	„	„	567	„	„	24	4·2

Clichy-sous-Bois.

2. At Clichy-sous-Bois, in a loamy soil, where the disease was of considerable severity.

Disease-resisting Varieties.	Dressed Plot. 3·9 Perches.			Undressed Plot. 3·9 Perches.			Increase of Yield by the Treatment.	
	Total weight of Crop.	Diseased.		Total weight of Crop.	Diseased.			
		Weight.	Per cent.		Weight.	Per cent.	Weight.	Per cent.
	Lbs.	Lbs.	%	Lbs.	Lbs.	%	Lbs.	%
Richter's Imperator -	1,001	11	·09	849	20	2·4	161	19·3
Red Skinned - -	790	11	·13	713	15	2·1	95	13·2

These tables show that even with resisting varieties, and in spite of the results at Ivinville, the neglect of the treatment would have involved a loss per acre of 2·90 tons as regards the Imperator, and of 1·68 tons in the Red Skinned at Clichy. M. Girard's experiments.

M. Girard points out, however, that it must be remembered that several conditions are essential to insure success. The ingredients must be pure, they must be mixed with care, and the distributor must be in good working order. The copper sulphate crystals should be blue in colour and limpid. Conditions essential to success.

The method usually adopted of dissolving them in the field just before using the dressing, is slow and inconvenient, and the following process is recommended instead.

At the farm-house, 40 lbs. of sulphate of copper crystals should be broken up into small fragments, and placed in a tub into which are poured 10 gallons of water, which should be nearly at the boiling point. The crystals soon dissolve, and when the solution is cold it is transferred to a small cask for transport to the field. One gallon of this solution is then poured into a larger tub or cask in which the mixture is to be completed, a wooden bucket being used for this purpose. The bucket should be marked inside to show the level of one gallon of liquid, and the larger tub should be similarly marked to show the level of 20 gallons of liquid. The gallon of solution, which contains 4 lbs. of dissolved copper sulphate, is then diluted with 10 gallons of water, and the large tub is subsequently filled to the level denoting 20 gallons of liquid, by the re-agent which will precipitate the copper in the form of bouillie. Copper.

Should it be desired to employ soda as the re-agent, it is recommended that care should be taken to exclude the soda crystals known as "mixed crystals," which contain more sulphate than carbonate. For convenience again, a stronger solution of soda may be made at the house. In this instance a metal receptacle may be employed, marked to show the level of 10 gallons, and in this 120 lbs. of soda crystals are dissolved in 10 gallons of lukewarm water. When cold, this solution is taken to the field and poured into the cask which contains the copper sulphate solution, in the proportion of one gallon for the one gallon of copper sulphate used. Water is then put into the large cask up to the level denoting 20 gallons. The mixture must be thoroughly stirred and used without delay. This quantity of solution will suffice to treat from 21 to 25 perches. Soda.

If lime is desired as the re-agent, great care must be taken in its selection. It should always be previously tested as follows:—Immerse a small quantity of the lime in cold water until effervescence from the solid lime ceases. Transfer the mass from the water to a plate. If the lime crumbles entirely into powder it is good lime, but if there remain stony or gritty particles it will not give good results. Lime.

Good lime being chosen, it should be weighed and then slaked. A known quantity of water is then added, and the lime water thus obtained is taken to the field, and a quantity, containing

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M. Girard's experiments.

5 or 6 lbs. of quick-lime in solution, is poured into the barrel already containing the solution of 4 lbs. of copper sulphate, sufficient to make 20 gallons of bouillie.

Sucrated solution.

Lastly, if the sucrated solution of M. Perret is preferred, it is well to dissolve at the farmhouse not only the copper sulphate, but also the molasses, which should be dissolved in hot water, so as to take into the field solutions of known strength and lime water of known composition. The operation of mixing with the aid of a measured bucket or tub will present no difficulty.

M. Girard states that it is at the end of June, or at the time when the leaf reaches its fullest development, that the dressing should be applied in quantities of from 140 to 160 gallons per acre. It is an important fact to remember that the total leaf surface of a potato crop is equal to six times the area of the field. It is better to apply the dressing in one treatment, as the damage to the foliage by the operator passing through the rows is then reduced to a minimum.

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Experiments at Göttingen.

EXPERIMENTS AT GÖTTINGEN.

The Board have received from Dr. Liebscher, of the Agricultural Institute attached to Göttingen University, a report on a series of experiments conducted by him to determine the value of bouillie bordelaise and sulpho-steatite of copper as remedies for potato-disease.

Experiments of 1890.

The experiments were carried out in 1890, 1891, and 1892 in the fields attached to the Institute. In the first of the years mentioned a large plot, planted with many different varieties of potatoes, was dressed with the bouillie bordelaise. The first dressing was applied on June 28th, when traces of the disease were beginning to appear on the leaves of the plants. A somewhat weak solution of sulphate of copper was used (15 lbs. of sulphate of copper to 100 gallons of water) at the rate of 27 gallons per acre. Four weeks later the plants were again dressed with bouillie bordelaise of the usual strength (20 lbs. of sulphate of copper to 100 gallons of water) at the rate of 44½ gallons per acre.

The treatment had practically no effect, a result which Dr. Liebscher thinks is probably to be attributed to the first dressing having been applied too late. The early varieties of potatoes were attacked with the disease on both the dressed and undressed plots, but the later sorts, which formed the major portion of the crop, entirely escaped.

Experiments of 1891.

In 1891 the experiment was restricted to a variety of potatoes know to be particularly susceptible to disease, viz., the Biscuit

Experiments at Göttingen.

potato. The experimental field was about 1¼ acres in extent, and divided into three equal portions, one of which was left untreated as a control plot, while the remaining two sections received three dressings of bouillie bordelaise and sulpho-steatite of copper respectively. The bouillie employed was a 1½ per cent. solution of sulphate of copper (15 lbs. of sulphate of copper to 100 gallons of water), applied on each occasion at the rate of 22½ to 27 gallons per acre. The sulpho-steatite of copper was applied according to the directions given by the firm supplying this material.

Notwithstanding the fact that the first application of these dressings was made immediately after the plants began to rise, the disease made its appearance and spread so rapidly on all three plots that by the beginning of August, when the dressing was applied, the potato haulms were already dying off. The dressed plants, however, remained green longer than those in the central plot, but this difference amounted to a few days only in the case of the section treated with sulpho-steatite of copper, while the plants dressed with bouillie bordelaise remained green seven to 14 days longer than those of the untreated plot. The result was as follows :—

Yield of Potatoes per Acre.

Results.

—	Sound.	Diseased.	Total.	Increased Yield by Dressing.
	Cwts.	Lbs.	Cwts.	Cwts.
Control plot	17·7	47	17·3	—
Plot dressed with sulpho-steatite.	19·6	47	19·2	1·9
Plot dressed with bouillie bordelaise.	26·8	80	26·1	8·8

Dr. Liebscher remarks that the application of copper dressing did not prevent a total failure of the crop as regards quantity, although the increased yields of 1·9 and 8·8 cwts. per acre respectively cover the cost of the treatment. He adds that a better result would probably have been obtained in 1891, which was a wet year, if the dressings had been applied weekly instead of on three occasions only.

Experiments of 1892.

The experiments were repeated in 1892 on a field of potatoes of the same area (about 1¼ acres), divided into three sections as before, one of which was left untreated while the remaining two were dressed with bouillie bordelaise and sulpho-steatite of copper respectively. Fourteen varieties of potatoes were planted across the three plots. The first application of the dressings took place on 7th and 8th of June. The treatment was repeated on the 22nd and 23rd of June. The final dressing of bouillie bordelaise

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Experiments at Göttingen.

No disease.

was applied on 18th and 19th of July, while the third application of sulpho-steatite of copper was made on 4th August.

Owing to the dryness of the summer the disease did not make its appearance in Göttingen, and all the potatoes remained perfectly sound. At the end of August from four to six weeks after the last dressing, there were clearly visible signs that the copper preparations had injuriously affected the foliage of all the dressed potatoes, the tubers were therefore taken up from the three plots separately.

Dressings injure plants.

This injury Dr. Liebscher says is not to be regarded as an acute poisoning as would easily arise if copper dressings were applied in too great strength and in large quantities. For the injury did not make its appearance suddenly and immediately after the application of the copper solution, but it first became visible about four weeks after the last dressing in the form of a curling of the foliage which spread gradually from one variety to another at a period when very few traces of the copper preparation were to be seen on the leaves. He remarks that, unfortunately, it was not ascertained whether the injury sprang from the copper which had been carried into the earth or from that which had been dissolved by the rain and dew on the leaves. He adds, however, that the fact that the otherwise sound potatoes had been injured by the copper was so manifest, that there could have been no possible doubt about the matter, even if the yield as regards quantity had not been determined. The yields of the different varieties were however weighed, and the results fully corroborated the observations made as to the injury done to the plants by the dressings.

Yield per acre.

The produce of each kind of potatoes calculated to the acre, was as follows:—

Variety.	Untreated Plot.	Plot dressed with Bouillie Bordelaise.	Plot dressed with Sulpho-steatite of Copper.
	Tons.	Tons.	Tons.
Simson	9·1	7·1	3·5
Aspasia	9·7	8·9	7·5
Snowrose	12·4	9·6	8·7
Dr. Eckenbrecher	11·8	8·6	7·4
Athene	11·1	8·5	7·1
Minster Lucius	11·7	8·9	8·0
Juno	9·1	7·2	6·6
Imperator	13·7	9·1	8·4
Prof. Oehmischen	11·1	7·8	7·3
Fürst von Lippe	10·0	8·4	7·1
Reichskanzler	8·4	7·6	6·6
Blaue Riesen	11·2	9·4	8·2
Saxonia	9·1	7·6	6·9
Magnum Bonum	11·9	11·2	10·0
Average	10·7	8·6	7·4
„ in relative figures.	100	80	69

Experiments at Göttingen.

Commenting on the above Dr. Liebscher observes that each of the 14 varieties shows without exception that in 1892 a year in which the potato crop was abundant owing to the absence of disease, the application of bouillie bordelaise and sulpho-steatite of copper reduced the yields by about 20 per cent. and 30 per cent. respectively. He maintains that the decreased yield was undoubtedly the result of a chronic poisoning of the plants by the copper. The experiments were conducted with such care that there can be no question of the application of an excessive quantity of the dressings, nor of defects in their preparation. Dr. Liebscher concludes therefore that the results point to an unexpected secondary action of the copper salts, which is so significant that he considers it necessary to warn farmers and others against the indiscriminate use of copper dressings. He points out however that although these preparations may act as a poison to sound plants they are equally poisonous to the fungus causing the potato disease. Many experiments, he observes, have proved that these dressings arrest the development of the fungus, and though they may not be capable of completely preventing a failure of the crops in wet years favourable to the spread of fungus, yet their application in years when the disease makes its appearance may considerably reduce the loss arising from the disease.

Agriculturists warned against indiscriminate use of dressings.

Dr. Liebscher regards the so-called preventive treatment, which consists in applying the dressings before the disease makes its appearance, as absolutely worthless. He remarks that by adopting this method an undesired injury to the growth of the potatoes through the copper is sure to arise, while the desired injurious effect on the fungus will depend on whether the weather is favourable to the appearance of the disease or not.

Preventive treatment worthless.

On the other hand when the disease has once made it appearance Dr. Liebscher recommends the application of bouillie bordelaise, which he says is much more effective than the sulpho-steatite of copper. He advises, further, that its application should not be limited to two or three dressing, but that the plants should always exhibit traces of the dressings, even though in wet weather the operation should have to be repeated every week.

Dr. Liebscher concludes by remarking that although the bouillie bordelaise may injure the potato plants, it is much more injurious to the potato fungus, and that therefore the final results of its application may be represented by a favourable effect on the yield of the crop. He does not therefore advise the discontinuance of the use of copper dressings, but he cautions farmers against the inconsiderate systematic application of such dressings and against entertaining the all too sanguine expectations which attended the introduction of these preparations of copper.

Dr. Liebscher's conclusions.

Dr. Liebscher proposes to continue his experiments in the current season should there be an outbreak of potato disease.

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EXPERIMENTS AT DRESDEN.

Experiments at Dresden.

The Board are indebted to Dr. Steglich, Director of the Agricultural Experiment Station at Dresden, for a copy of a paper read by him in March 1893 before the Teltower Agricultural Society at Berlin respecting the results of some experiments conducted at Dresden in 1891, with copper and iron solutions as remedies for potato-disease.

The liquid dressings used in Dr. Steglich's experiments consisted of ordinary bouillie bordelaise (sulphate of copper, lime, and water), sulpho-steatite of copper (a powder composed of about 10 per cent. sulphate of copper to 90 per cent. of soapstone), and a solution of sulphate of iron, lime, and water. The sulpho-steatite of copper was applied by means of a pair of bellows, while the liquid dressings were distributed by a special spraying apparatus.

Three applications.

There were three applications of the bouillie bordelaise and sulphate of iron, and on each occasion 110 gallons of each of these solutions were used. The first dressing was the ordinary 2 per cent solution, but the second and third were stronger, viz., 2·5 per cent. and 4 per cent. respectively.

The powder was also applied three times; in the first dressing 105 lbs. were used, but this quantity was increased to 145 lbs. for each of the subsequent applications.

The experimental plots were four in number; each plot was 11·9 perches in area, and divided into six sections on which the following varieties of potatoes were grown:—

1. Saxon Zwiebel. 2. Lerche. 3. Biscuit. 4. Champion. 5. Andersen. 6 Magnum Bonum.

In order to ensure an outbreak of the disease, manure containing diseased potatoes was spread over the plot, and diseased seed was purposely sown. Several varieties of potatoes were grown as it was felt that this course would not only facilitate an outbreak of the disease, but would at the same time indicate the behaviour of the different varieties under the treatment.

The processes of tillage, manuring, planting, and similar operations were carried out in a uniform manner on all the plots. The growth of the plants was quite normal.

Dates of application.

The dressings were applied to plots, II., III., and IV. on 12th June, 17th July, and 15th August. Plot II. was treated with bouillie bordelaise, plot III. with sulphate of iron, and plot IV. with sulpho-steatite of copper Plot I. was not treated, and served as the control plot.

The results of the treatment are shown below :—

Experiments at Dresden.

Results.

Plot I. Undressed or Control Plot.

Variety.	Date of Appearance of Disease.	Date when the Haulms Died Off.	Yield in Lbs.	Per-centage of Diseased Tubers.	Per-centage of Starch.
1. Saxon Zwiebel -	27th July	28th Aug.	110	14·6	14·7
2. Lerche - -	25th „	22nd „	136	14·0	14·5
3. Biscuit - -	26th „	28th „	86	38·5	13·0
4. Champion - -	28th „	26th „	263	6·3	16·6
6. Andersen - -	28th „	4th Oct	255	—	14·7
6. Magnum Bonum -	27th „	20th Sept.	201	1·3	12·3

Bouillie bordelaise.

Plot II. Dressed with Bouillie Bordelaise.

Variety.	Date of Appearance of the Disease.	Date when the Haulms Died Off.	Yield in Lbs.	Yield compared with Plot I.	Per-centage of Diseased Tubers.	Per-centage of Diseased Tubers compared with Plot I.	Per-centage of Starch.	Per-centage of Starch compared with Plot I.
				Lbs.				
1. Saxon Zwiebel -	27th July	8th Sept.	168	+26½	13·7	−0·9	14·9	+0·3
2. Lerche - -	26th „	30th Aug.	148½	+6	14·8	+0·8	15·1	+0·6
3. Biscuit - -	27th „	5th Sept.	142	+25½	4·1	+2·5	14·3	+1·3
4. Champion - -	29th „	7th Oct.	294	+14	5·2	−1·1	17·9	+1·3
5. Andersen - -	29th „	—	300	+20½	0·7	+0·7	17·1	+2·4
6. Magnum Bonum	28th „	27th Sept.	221	+9	1·0	−0·3	14·1	+1·9

Sulphate of iron.

Plot III. Dressed with Sulphate of Iron.

1. Saxon Zwiebel -	26th July	23rd Aug.	102½	−3½	10·0	−4·6	13·5	−1·2
2. Lerche - -	26th „	20th „	121	−7	17·2	+3·2	14·3	−0·3
3. Biscuit - -	26th „	22nd „	74	−5½	23·9	+1·6	12·5	−0·5
4. Champion -	28th „	25th Sept.	251	−5½	7·0	+0·7	16·6	+0
5. Andersen -	27th „	29th „	253	−1	1·3	+1·3	14·5	−0·2
6. Magnum Bonum	28th „	18th „	176	−11	—	−1·3	12·5	+0·3

Sulpho-steatite of copper.

Plot IV. Dressed with Sulpho-steatite of Copper.

1. Saxon Zwiebel -	27th July	26th Aug.	123	+5½	14·3	−0·3	15·1	+0.4
2. Lerche - -	27th „	23rd „	141	+2½	15·1	+1·1	14·7	+0·2
3. Biscuit - -	27th „	25th „	96	+5½	36·9	−1·6	13·8	+0·8
4. Champion - -	27th „	26th Sept.	263	+0	6·7	+0·4	13·9	−2·7
5. Andersen - -	28th „	6th Oct.	263	+3½	1·2	+1·2	15·8	+1·1
6. Magnum Bonum	28th „	22nd Sept.	200	−½	—	−1·3	12·5	+0·3

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Appearance of disease.

From the foregoing table of results it follows that as all the plots and all the varieties of potatoes were attacked by the disease, none of the dressings had the effect of entirely preventing its appearance. The disease first broke out on July 25th, after a period of rain, on the undressed plot among the Lerche potatoes, and quickly spread to the two neighbouring varieties, Biscuit and Saxon Zwiebel. It then attacked the Magnum Bonum, afterwards the Champions, and finally the Andersens. By the 29th July the disease had invaded the whole of the experimental field. The intensity of the attack on the different varieties could be observed by the discolouration of the foliage. The effects of the dressings as indicated by the appearance of the plants were as follows:—The plot dressed with sulphate of iron presented the most unfavourable appearance; next in order came the undressed section; the plot treated with sulpho-steatite of copper looked only slightly better; the plants on the plot dressed with bouillie bordelaise presented the most favourable appearance.

At first the aspect of the experimental field seemed to give the impression that the power of resistance possessed by the individual varieties to the disease had far more effect than the application of the dressings. Later on, however, this feature was changed in so far that the haulms of the several varieties died off on the dressed plots in the order indicated when describing the visible effects of the dressings, viz.:—(1) on the plot dressed with sulphate of iron; (2) on that treated with sulpho-steatite of copper; (3.) on the plot dressed with bouillie bordelaise.

The yields and percentages of starch confirmed these outward indications, for the yield of the plot dressed with the bouillie was the highest, then followed the plot treated with sulpho-steatite of copper which yielded a crop only slightly in excess of the untreated plot, while the section treated with sulphate of iron produced the least. The percentages of starch followed the same order.

Sulphate of copper best.

Thus it would appear that the solution of sulphate of copper and lime acted as a good preservative; the sulpho-steatite of copper had only a slight preservative effect; and the sulphate of iron solution was almost injurious.

Dr. Steglich observes that the noxious action of the sulphate of iron was to be anticipated and that it arises from the poisonous properties of the protoxide of iron present in this material.

With reference to the relatively high percentage of diseased tubers yielded by the plots treated with the dressings which proved effective, Dr. Steglich remarks that for this there is the very simple explanation, that the nature of the dressings and the mode of their application are such that they can only have effect in arresting the progress of the disease on the foliage of the plants; the successfully treated haulm remains greener longer and thus enables the plant to proceed with the development of

Experiments at Dresden.

tubers. Hence the success of the treatment is in the first place to be sought for in an increased yield, and secondly in a diminution of the percentage of diseased tubers.

The success which attended the use of the copper dressings may be better seen in the following table which shows the net value per acre of the increased yield of healthy tubers obtained by application of the dressings, less the cost of treatment. Dr. Steglich has omitted from this statement the results yielded by the plot dressed with sulphate of iron as this preparation proved to be practically useless.

Results of treatment.

Yield per Acre of Healthy Tubers.

—	Saxon Zwiebel.	Lerche.	Biscuit.	Champion.	Andersen.	Magnum Bonum.
1. Bouillie Bordelaise:—						
Yield of dressed plot in tons	Tons. 5·25	Tons. 4·77	Tons. 3·00	Tons. 10·07	Tons. 10·78	Tons. 7·91
Yield of undressed or control plot in tons.	3·39	4·42	1·90	8·91	9·22	7·16
Increased yield from the treatment in tons.	1·86	0·35	1·10	1·16	1·56	0·75
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Value of increased yield, at 51*s.* per ton.	94 11	17 10	55 11	58 6	79 5	40 2
Less cost of treatment -	13 8	13 8	13 8	13 8	13 8	13 8
Net gain - -	81 3	4 2	42 3	42 10	65 9	26 6
2. Sulpho-steatite of copper:—						
Yield of dressed plot in tons	Tons. 3·77	Tons. 4·33	Tons. 2·23	Tons. 8·87	Tons. 9·38	Tons. 7·24
Yield of undressed or control plot.	3·39	4·22	1·90	8·91	9·22	7·16
Increased yield from the treatment.	0·38	0·11	0·33	—	0·16	0·08
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Value of increased yield at 51*s.* per ton.	19 5	5 7	16 10	—	8 2	4 1
Cost of treatment - -	24 4	24 4	24 4	24 4	24 4	24 4
Net loss - -	4 11	18 9	7 6	24 4	16 2	20 3

Cost of treatment.

The following are the items included under "Cost of Treatment" calculated to the acre:—

1. Bouillie bordelaise:—	£	*s.*	*d.*
First application = 44½ gallons of a 2 per cent. solution.			
9 lbs. of sulphate of copper - - -	0	2	0
9 lbs. of lime - - - -	0	0	1
Second application = 44½ gallons of a 2·5 per cent. solution.			
11¼ lbs. of sulphate of copper - -	0	2	7
11¼ lbs. of lime - - - -	0	0	1

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	£	s.	d.
Cost of materials for first and second applications	0	4	9
Third application = 44½ gallons of a 4 per cent. solution.			
18 lbs. of sulphate of copper - -	0	4	0
18 lbs. of lime - - - - -	0	0	2
Labour, preparation and distribution of three dressings - - - -	0	4	3
Wear and tear of spraying apparatus -	0	0	6
	0	13	8
II. Sulpho-steatite of copper:—			
First application 43 lbs. at 15*s.* per cwt. -	0	5	9
Second application 59 lbs. at 15*s.* per cwt. -	0	8	0
Third application 59 lbs. at 15*s.* per cwt. -	0	8	0
Labour and wear and tear of apparatus -	0	2	7
	1	4	4

Dr. Steglich's conclusions.

From the above results Dr. Steglich concludes that the treatment of potatoes with bouillie bordelaise is not only effective against the *phytophthora infestans*, but also profitable, since the costs of the treatment are fully covered, and in most cases there is a considerable balance to the good. He thinks that the cause of the indifferent results obtained by the use of the sulpho-steatite of copper may perhaps lie in the fact that the powdery preparation conveys too small a quantity of copper in active form to the plants, and that a large proportion of the dressings (about 50 per cent.) is dissipated by the wind. But it should also be noted that the application of this remedy costs nearly twice as much as that of the bouillie bordelaise, so that when the results are not very successful the expense of its application are never covered, while even with very favourable results the cost of the treatment absorbs a disproportionately large share of the gross profit obtained by its adoption.

Experiments on larger scale at Limbach.

Simultaneously with the carrying out of the above experiments at Dresden, an experiment with bouillie bordelaise was conducted on a larger scale under the direction of Dr. Steglich on a farm at Limbach.

A field of 22 acres sown with Magnum Bonum was selected for the experiment, and the dressing was distributed over the entire field with the exception of a piece of 1¼ acres, which was reserved as a control plot. The bouillie was not applied until late in the season, at the beginning of August, when the disease had already invaded the field in every part. The copper solution was of the ordinary strength, 2 per cent., and was distributed at the rate of 46 gallons per acre. A fortnight after the dressing a remarkable difference could be observed between the colour of the foliage of the dressed and undressed potatoes. By the beginning of September the haulms on the untreated plot were

quite dead, while the dressed plants remained green until the end of the month.

Experiments at Limbach.

The results, calculated to the acre, were as follows:—

Results.

	Cwts.
Yield per acre of the dressed plot -	97·6
„ „ undressed plot -	74·6
Increased yield from the dressing	23·0

	£	s.	d.
Value of increased yield at 2s. 6d. per cwt. -	2	17	6
Less cost of treatment:—			
46 gallons of 2 per cent. solution.			
	s.	d.	
9·2 lbs. of sulphate of copper -	1	10	
9·2 „ lime - - -	0	1½	
Labour and wear and tear of apparatus - - - -	1	5½	
	0	3	5
Net profit per acre by the treatment - -	2	14	1

Dr. Steglich points out that at Limbach the results were much more favourable and the cost of treatment lower than in the case of the experiments conducted at Dresden. From the results at Limbach it might be concluded that three applications of the treatment, viz., in June, July, and August, are superfluous, and should be replaced by one dressing only applied in August.

Treatment in August most essential.

Dr. Steglich is, however, of a distinctly contrary opinion. He states that it cannot be denied that the treatment in August is by far the most essential, since the disease does not, as a rule, appear till the end of July or the beginning of August, at least among the later varieties, so that with these the June treatment can, at any rate, be omitted; but it should never be omitted with the early ripening varieties. He adds, however, that in any case the treatment should be commenced in July and repeated in August, as it is important to cope with the disease on its first outbreak.

In explanation of the fact that the single application of the treatment in August at Limbach proved quite as successful as the three applications at Dresden, attention is directed to the protracted and exceptionally luxurious growth of the foliage of the plants in 1891, whereby, even in August and into September, after the disease had been arrested by the treatment, the plants continued to form new leaf-organs, and the leaves remained green and preserved the powers of assimilation. The potato haulms grew to a certain extent away from the disease. Had not the conditions in this respect been so favourable it is asserted that the haulms would have died off in August and the treatment would have been too late to save them. Besides it is possible that the

Experiments at Limbach.

results at Limbach might have been even more satisfactory had the treatment been applied earlier or more often

Further investigation needed to determine period of treatment.

Dr. Steglich is of opinion that the question as to the period at which the application of the treatment is absolutely necessary, and as to when it may be omitted, can only be determined by exact physiological and mycological investigations which shall determine what stage of growth of the potato plant is most favourable to the disease. Until then he thinks that it will be advisable to apply an extra and earlier dressing of the bouillie bordelaise, rather than to apply it too late and in too small a quantity.

In his conclusions on the results of these experiments at Dresden and Limburg, Dr. Steglich remarks that the bouillie bordelaise may be regarded as a sufficiently effective, cheap, and practical remedy for checking the disease of the potato caused by the *phytophthora infestans*, and it is desirable that agriculturists should adopt the treatment as one of the regular operations in potato-culture.

He adds that in order to ensure the harmlessness of the copper preparations, it is a primary condition that they should contain no undissolved copper salts; the bouillie bordelaise is always injurious if it contains undissolved sulphate of copper, which may be ascertained by acid reaction.

Comments on Dr. Liebscher's experiments.

Commenting on the unfavourable results of the experiments conducted by Dr. Liebscher at Göttingen, Dr. Steglich remarks that since it cannot be assumed that the solutions used were improperly prepared, it must be concluded that a too strong concentration of the dressings is injurious, and this may arise in consequence of excessive heat and absence of dew (notwithstanding that the dressings have been carefully prepared and properly applied), if the treatment is carried out on a particularly hot day or during the hottest part of the day.

EXPERIMENTS BY DR. P. SORAUER.

Dr. Sorauer's experiments.

In the "Zeitschrift für Pflanzen Krankheiten, 1893," Dr. Paul Sorauer reports the results of a carefully conducted experiment with bouillie bordelaise and sulpho-steatite of copper on two varieties of potatoes known as Six Weeks and Early Blues.

The potatoes were sown in heavy garden soil at the beginning of May 1891, and the dressings mentioned above were first applied on June 3rd. The application was repeated whenever the frequent rains had washed off a large proportion of the copper. The repetition of the dressing was never delayed long enough to permit the natural green tint of the leaves to predominate.

Bouillie bordelaise and sulpho steatite of copper used.

The experiment was carried out in such a way that each of the two plots was divided into three rows, one of which was dressed with the bouillie, the second with the sulpho-steatite, and the third was left untreated.

Dr. Sorauer's experiments.

The growth of the plants was unusually luxuriant and at first uniform in all the rows, later, however, the plants in the dressed rows, especially those dressed with sulpho-steatite of copper, did not grow quite so high as the undressed stocks. On measuring a large number of leaflets on leaves of the same age and situated at the same height on the stalks, it was found that those of the plants which had been dressed with copper were of a slightly smaller size on the average, while at the ripening period the stalks of the dressed plants began to fall earlier although the foliage had not lost its vitality.

The *phytophthora infestans* appeared on 22nd July, and on that day 10 plants in each row were taken up. The average yield of 10 plants at this period was found to be as follows—the weights are small owing, it is stated, to the fact that the potatoes had not arrived at maturity :—

Results on 22nd July.

A.—*Six Weeks Potato.*

	Large Tubers.		Small Tubers.	
	No.	Weight.	No.	Weight.
		Lbs.		Lbs.
1. Plants dressed with bouillie bordelaise.	28	1·9	102	1·5
2. Plants dressed with sulpho-steatite of copper.	33	2·1	119	2·0
3. Undressed plots - -	38	2·9	43	0·9

B.—*Early Blue Potato.*

	Large Tubers.		Small Tubers.	
	No.	Weight.	No.	Weight.
		Lbs.		Lbs.
1. Plants dressed with bouillie bordelaise	35	2·2	89	1.8
2. Plants dressed with sulpho-steatite of copper.	25	1·3	49	1·0
3. Undressed plants - -	89	6·4	77	1·4

Dressing depressed yield slightly.

Dr. Sorauer remarks that the above figures indicate that the slight depression in the development of the foliage caused by the use of the copper dressings is also reproduced in the yield. In the case of the undressed plants the tubers continued to grow without intermission, for in both varieties these plants yielded many more large tubers than the dressed plants and their total yield in weight was also greater. No diseased tubers were found on July 22nd.

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Dr. Sorauer's experiments.

This result it is observed is an encouragement to leave undressed the very early sorts, which are approaching ripeness about the period when the disease usually makes its appearance, since the crop is then larger, and this is a great consideration in view of the high prices obtained for early potatoes.

Dr. Sorauer observes, however, that so favourable a result is only to be expected when it is possible to harvest the crop immediately on the appearance of the first symptoms of the disease. The effect will be very different if the disease spreads on the foliage even for a few days only, as is shown by the following results which Dr. Sorauer shows to have been obtained on taking up 10 more stocks from each row a week later, *i.e.*, on July 29th. The disease had made much progress in the meantime, the fungus had not attacked the youngest leaves but those next in age, so that although the plants were not hindered from growing they were attacked in their chief organs of activity. Those which had been dressed with the cuprous preparations were not free from the disease, but they exhibited a decidedly better development of foliage than those in the central or undressed rows.

Results a week later.

The yield of 10 plants taken from each row was as under :—

A.—*Six Weeks Potato.*

	Large Tubers.		Small Tubers.		Percentage of Diseased Tubers.
	No.	Weight.	No.	Weight.	
		Lbs.		Lbs.	
1. Plants dressed with bouillie bordelaise.	45	3·2	92	1·8	0·00
2. Plants dressed with sulpho-steatite of copper.	36	2·6	101	2·2	1·98
3. Undressed or control plants -	33	2·6	91	2·6	59·4

B.—*Early Blue Potatoes.*

	Large Tubers.		Small Tubers.		Percentage of Diseased Tubers.
	No.	Weight.	No.	Weight.	
		Lbs.		Lbs.	
1. Plants dressed with bouillie bordelaise.	52	4·6	97	2·6	1·03
2. Plants dressed with sulpho-steatite of copper.	31	2·0	73	1·7	31·8
3. Undressed or control plants -	53	4·5	69	1·9	67·1

In reviewing these results Dr. Sorauer points out that they show that the second variety is more productive than the first. This feature is however of no significance here. The question of weight has to be considered in respect of the individual rows of each variety. It is seen that the superiority in weight observed in the undressed rows on the first appearance of the disease is no longer maintained. The plants dressed with bouillie bordelaise yielded a greater weight of potatoes, especially in large tubers: a fact from which it may be concluded that the preservation of the foliage enabled the tubers, which were in process of full development at the period when the disease first appeared, to continue to grow without interruption, while the growth of the tubers of the control plants, which, on July 22nd, had exhibited a degree of development equal to that of the neighbouring plants, was subsequently hindered by the destruction of their vigorous foliage.

Dr. Sorauer's experiments.

Dressed plants gave greater yield.

Dr. Sorauer remarks that the favourable effects of the treatment, with cuprous preparations, is seen to its full extent when the percentage of tubers attacked with the disease within the week (22nd to 29th July) is compared with the gross yields.

The conclusion he draws from the experiments recorded above is that copper dressings in any case must arrest, to a certain extent, the development of the potato plants, and may reduce the yield of tubers compared with that produced by healthy untreated plants but that the dressings nevertheless increase the yield, as a matter of fact, because they considerably diminish the otherwise, unavoidable loss caused by the *phytophthora*.

Dr. Sorauer's conclusions.

POSTAL CONGRESS OF VIENNA, 1891.

RETURN to an Order of the Honourable The House of Commons, dated 12 May 1893;—*for*,

COPIES "of the Proceedings of the Sub-Committee of the Vienna Postal Congress of 1891 relative to the conditions on which the Australasian Colonies were admitted to the Postal Union; of the Papers submitted to the Foreign Office respecting the right of this Country, having regard to Covenants entered into at the said Postal Union Congress, to reduce or alter the amount of Postage chargeable on Letters sent to the Colonies, and of the opinion thereon; and of the Instructions given to the Representatives of this Country at the said Congress with reference to the question of securing for the British Government freedom of action in reducing or fixing the Rates of Postage to the Colonies."

Treasury Chambers, 22 June 1893.

JOHN T. HIBBERT.

(*Mr. Henniker Heaton.*)

Ordered, by The House of Commons, *to be Printed*, 23 *June* 1893.

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COPIES of the Proceedings of the Sub-Committee of the Vienna Postal Congress of 1891 relative to the conditions on which the Australasian Colonies were admitted to the Postal Union; of the Papers submitted to the Foreign Office respecting the right of this Country, having regard to Covenants entered into at the said Postal Union Congress, to reduce or alter the amount of Postage chargeable on Letters sent to the Colonies, and of the opinion thereon; and of the Instructions given to the Representatives of this Country at the said Congress with reference to the question of securing for the British Government freedom of action in reducing or fixing the Rates of Postage to the Colonies.

I.—Report of the Sub-Committee of the Vienna Postal Congress on their Proceedings.

Monsieur le Président et Messieurs,

Vous inspirant du précédent du Congrès postal de Lisbonne, vous avez chargé une Sous-Commission composée des délégations de l'Allemagne, des États-Unis d'Amérique, de l'Autriche, de la France, de la Grande-Bretagne, de la Hongrie, de l'Italie et de la Russie, du soin d'entendre les représentants des colonies d'Australasie et de se concerter avec eux sur les moyens de faciliter l'entrée de ces colonies dans l'Union postale.

Cette Sous-Commission s'est réunie le 22 mai. Elle a prié S. Exc. M. le Dr. de Stephan d'accepter les fonctions de Président et a bien voulu me confier celles de Rapporteur.

Après avoir souhaité la bienvenue à Messieurs les délégués d'Australasie et exprimé l'espoir que l'activité industrielle et commerciale de leurs pays allait prochainement recevoir, du fait de leur adhésion à l'Union, une impulsion nouvelle, M. le Président les a conviés à formuler leurs propositions.

Au nom de la délégation australasienne, M. Buxton Forman a exposé que les statistiques présentées à Lisbonne sur l'importance des colonies australasiennes accusaient, depuis six ans, un notable développement; que ces colonies avaient le plus vif désir d'entrer dans l'Union, mais qu'en raison de différences d'intérêts, elles désiraient obtenir deux voix, qui seraient attribuées: l'une à l'Australie occidentale, à l'Australie méridionale, à Victoria et à la Tasmanie; l'autre à la Nouvelle-Galles du Sud, à Queensland, à la Nouvelle-Zélande, à la Nouvelle-Guinée et aux îles Fidji.

Sir Arthur Blackwood a ajouté que les colonies précitées, possédant chacune une administration autonome, ne devaient pas être considérées comme un seul pays; elles ne prétendent pourtant pas à une voix pour chacune; elles se bornent à réclamer deux voix correspondant aux deux groupes du Nord et du Sud.

La délégation italienne a répondu que l'attribution de deux voix ne lui paraissait pas motivée, alors que de grands pays, dont toutes les parties n'ont pas les mêmes intérêts, ne disposent que d'une voix.

La délégation française s'est prononcée dans le même sens. Si l'on admettait que la diversité des intérêts et la position géographique pussent motiver l'obtention de voix distinctes, les pays qui possèdent des colonies dans diverses parties du monde seraient fondés à réclamer une voix pour chaque colonie ou groupe de colonies. Quelle distinction peut-on établir, en ce qui concerne les intérêts postaux, entre le Nord et le Sud du territoire australien? Les pays d'une grande étendue n'offrent-ils pas souvent des différences très accentuées à tous les points de vue entre les parties de leur territoire?

Le soin qu'apportent les Congrès postaux à tenir compte des situations exceptionnelles est d'ailleurs, pour les colonies australasiennes, une garantie de la sauvegarde de leurs intérêts spéciaux ou collectifs.

La délégation russe a appuyé les observations précédentes et fait remarquer, en outre, que les colonies australasiennes pourront se faire représenter, dans les Commissions ou Conférences de l'Union, par plusieurs délégués qui se feront les interprètes des vœux de chaque colonie ; il n'est donc pas nécessaire, pour la défense de leurs intérêts, qu'elles disposent de plusieurs voix.

La délégation allemande a fait ressortir, à son tour, l'inutilité de l'attribution de deux voix à l'Australasie, en rappelant, d'après de nombreux précédents, que, dans l'Union postale, *on pèse les voix plutôt qu'on ne les compte*. Il ne faudrait pas retarder, pour une simple question de forme, un résultat si impatiemment attendu de toutes parts. L'Empire allemand aussi se compose de plusieurs Etats dotés d'Administrations postales autonomes ; néanmoins, l'Allemagne, convaincue que ses intérêts seraient toujours ménagés, s'est contentée d'une voix unique. De même, les États fédérés du Dominion du Canada disposent seulement d'une voix. Leur situation paraît répondre, sinon dans le présent, tout au moins peut-être dans un avenir prochain, à celle des colonies d'Australasie.

Les délégations d'Autriche et de Hongrie ont déclaré qu'elles se ralliaient pleinement aux vues exprimées par celles d'Italie, de France, de Russie et d'Allemagne.

M. Forman a répliqué que, contrairement à ce qui existe dans les établissements coloniaux d'autres pays, chaque colonie d'Australasie possède un Gouvernement, un Parlement et un budget autonomes. Strictement, chacune d'elles pourrait donc prétendre à une voix ; c'est par esprit de conciliation et pour tenir compte de l'expérience faite au Congrès de Lisbonne, qu'elles se bornent aujourd'hui à solliciter deux voix, qui correspondraient à la situation géographique ou aux intérêts commerciaux des deux groupes constitués à cet effet.

La délégation française a fait observer de nouveau que même en supposant des intérêts distincts, deux voix ne sont pas nécessaires pour la sauvegarde de ces intérêts. Si l'on admettait la multiplicité des voix en proportion des intérêts, certains grands États seraient fondés aussi à en réclamer plusieurs et l'harmonie de l'Union postale serait détruite. L'expérience des Congrès précédents et les débuts du Congrès de Vienne témoignent du souci constant de tenir compte des situations exceptionnelles. Que cette préoccupation ne retarde donc pas une solution si désirée !

Sir Arthur Blackwood ayant alors exposé que les pouvoirs des représentants de l'Australasie ne leur permettaient pas, malgré leur bon vouloir, d'entrer dans l'Union postale avec une seule voix, M. le Président de la Sous-Commission les a priés de solliciter par voie télégraphique des instructions complémentaires, pour lever aussitôt que possible cette difficulté. Rendant un hommage mérité aux vaillants efforts faits devant la Sous-Commission par MM. les délégués d'Australasie, S. Exc. le Dr. de Stephan a ajouté que, dans sa conviction, leurs Gouvernements n'hésiteront pas à leur accorder les autorisations nécessaires pour consacrer l'œuvre importante du complément de l'Union postale.

MM. les représentants de l'Australasie ont déclaré qu'après avoir, dans la mesure du possible, cherché à obtenir une solution conforme à leurs instructions, ils ne croyaient pas devoir résister plus longtemps au vœu général et qu'ils allaient, en conséquence, solliciter de leurs Gouvernements l'autorisation d'adhérer à l'Union postale avec une voix unique. Ils ont demandé toutefois à être préalablement prémunis contre une modification immédiate tant du taux du transit maritime que de la taxe générale de 25 centimes par 15 g., et à être assurés que, dans leurs relations entre elles, les colonies australasiennes pourront appliquer des tarifs postaux inférieurs à ceux de l'Union postale.

A la suite d'un échange d'observations établissant, d'une part, que, sur ce dernier point, les colonies australasiennes tiendraient, de la Convention elle-même, le droit de former entre elles une union restreinte et, d'autre part, que, sur le premier point, il semblait possible de donner satisfaction aux préoccupations des intéressés, M. le Président résume les délibérations dans une formule qui est agréée par MM. les délégués d'Australasie et qui est ainsi concue :

" La

" La Sous-Commission ayant pris acte avec une satisfaction unanime de la déclaration de MM. les délégués d'Australasie, qu'ils sont disposés à entrer, à partir du 1er Octobre 1891, dans l'Union postale universelle avec une seule voix, sauf ratification de la part de leurs Gouvernements, a l'honneur de proposer à la Ire Commission de recommander au Congrès postal d'agréer l'accession des colonies d'Australasie à l'Union postale universelle. Il est entendu que les prix de transit maritime et la taxe de 25 centimes par 15 g. seront maintenus aux taux actuels, sauf révision par le prochain Congrès."

Le Rapporteur,
Ansault.

Le Président,
v. Stephan.

II.—Translation of the foregoing Report.

Mr. Chairman and Gentlemen,

Acting upon the precedent of the Postal Congress of Lisbon, you charged a Sub-Committee consisting of the delegations of Germany, the United States of America, Austria, France, Great Britain, Hungary, Italy, and Russia, with the duty of hearing the representatives of the Australasian Colonies, and concerting measures with them to facilitate the entry of those Colonies into the Postal Union.

That Sub-Committee, which met on the 22nd of May, asked his Excellency Dr. von Stephan to accept the functions of Chairman, and was good enough to entrust to me those of reporter.

After having bidden the Australian delegates welcome, and expressed the hope that the industrial and commercial activity of their countries would shortly receive from the fact of their adhesion to the Union a new impulse, the Chairman invited them to formulate their proposals.

In the name of the Australasian delegates Mr. Buxton Forman set forth that the statistics presented at Lisbon concerning the importance of the Australasian Colonies showed in the course of six years a notable developement; that those Colonies had the strongest desire to enter the Union; but that, in view of differences of interest, they wished to obtain two votes, which should be assigned, the one to Western Australia, South Australia, Victoria, and Tasmania, the other to New South Wales, Queensland, New Zealand, New Guinea, and the Fiji Islands.

Sir Arthur Blackwood added that the Colonies mentioned, each possessing an autonomous administration, ought not to be considered as a single country; they did not, however, pretend to a vote for each; they confined themselves to demanding two votes corresponding to the two groups of the North and South.

The Italian delegation replied that there did not appear to be sufficient motive for the assignment of two votes, seeing that great countries of which the parts have not the same interests have but a single vote at their disposal.

The French delegation expressed itself in the same sense. If it were admitted that diversity of interests and geographical position are a sufficient ground for obtaining distinct votes, those countries which possess colonies in various parts of the world would have ground for demanding a vote for each colony or group of colonies. What distinction can be established between the North and the South of the Australian territory? Do not countries of wide extent often show very accentuated differences in all points of view between the component parts of their territory? For the rest, the care with which postal congresses take into account exceptional situations affords the Australasian Colonies a guarantee that their interests, special and collective, would be safeguarded.

The Russian delegation supported the foregoing observations, and pointed out, moreover, that the Australasian Colonies could be represented in the committees or conferences of the Union by several delegates, who would themselves interpret the wishes of each colony; it is not therefore necessary for the defence of their interests that they should have several votes at their disposal.

The German delegation in its turn dwelt upon the uselessness of assigning two votes to Australasia, recalling how, according to numerous precedents, votes are *weighed rather than counted* in the Postal Union. The result so impatiently waited for on all sides must not be retarded for a simple question of

form. The German Empire also is composed of many states, endowed with autonomous postal administrations ; nevertheless, Germany, convinced that care will always be taken of her interests, has contented herself with a single vote. Similarly, the Federated States of the Dominion of Canada have but one vote at their disposal. Their situation appears to respond, if not at the present moment, at least perhaps in the near future, to that of the Australasian Colonies.

The delegations of Austria and Hungary declared that they agreed completely with the views expressed by those of Italy, France, Russia, and Germany.

Mr. Forman replied that the Australasian Colonies differ from the Colonial establishments of other countries in this, that each Colony has an autonomous Government, Parliament, and Budget. Strictly, then, each of them could pretend to a vote ; it is in the spirit of conciliation, and to take into account the experience made at the Congress of Lisbon, that they limit themselves now to soliciting two votes, which should correspond to the geographical situation, and to the commercial interests of the two groups formed to that end.

The French delegation pointed out again that, even supposing distinct interests, two votes are not necessary for the safeguarding of those interests. If multiplicity of votes were admitted in proportion to interests, certain great States would have good grounds for demanding also several votes ; and the harmony of the Postal Union would be destroyed. The experience of previous Congresses and the opening of the Congress of Vienna bear witness of constant care to take into account exceptional situations. This preoccupation should not be allowed to retard a solution so much desired.

Sir Arthur Blackwood having then stated that the powers of the representatives of Australasia did not permit them, notwithstanding their goodwill, to enter the Postal Union with a single vote, the chairman of the sub-committee begged them to seek by telegraph fresh instructions in order to get over this difficulty as soon as possible. Paying a deserved tribute to the valiant efforts made before the Sub-Committee by the delegates of Australasia, his Excellency Dr. von Stephan added that, in his conviction, their Governments would not hesitate to give them the necessary authority for achieving that important work, the completion of the Postal Union.

The representatives of Australasia stated that, after having sought to obtain as far as possible a solution in accordance with their instructions, they did not think that they ought to resist longer the general wish, and that consequently they were about to apply to their Governments for authority to adhere to the Postal Union with a single vote. They demanded, however, to be guaranteed, in the first place, against an immediate modification not only of the sea transit rates, but also of the general postage rate of 25 centimes per 15 grammes, and to be assured that in their relations among themselves the Australasian Colonies would be able to maintain postal tariffs lower than those of the Postal Union.

After an exchange of observations establishing, on one hand, that on this last point the Australasian Colonies would hold from the Convention itself the right to form between themselves a restricted union, and, on the other hand, that upon the first point it seemed possible to give satisfaction to the views of those interested, the chairman summed up the deliberations in a form conceived as follows, and accepted by the delegates of Australasia :—

The Sub-Committee having received with unanimous satisfaction the statement of the delegates of Australasia that they are disposed to enter the Universal Postal Union with a single vote from the 1st of October 1891, subject to ratification on the part of their Governments, has the honour to propose to the first committee that the Congress be recommended to accept the entry of the Colonies of Australasia into the Universal Postal Union. It is understood that the sea transit rates and the postage rates of 25 centimes per 15 grammes are to be maintained at the present fixed rate, unless revised by the next Congress.

III.—Papers submitted to the Foreign Office, and Opinion.

(*a.*) *Historical considerations.*

Up to about the year 1846, when Colonial Legislatures were granted to New Zealand and Australia, all matters connected with Colonial Posts, including both internal arrangements and the arrangements for postal communication from and to Great Britain, were under the control and management of the Postmaster General.

By Acts conferring these Legislatures, and by similar Acts in the case of Canada and other portions of the Empire, the control and management of the internal Colonial Posts were granted to Colonial Governments; but all matters connected with the transmission of letters between the Colonies and Great Britain were retained by the Imperial Government.

As a matter of fact, however, although the Imperial Government regulated the transmission of letters from Great Britain to the Colonies, it practically never interfered in the corresponding arrangement for the transmission of letters from the Colonies to Great Britain.

In 1874 the Universal Postal Union was established, the United Kingdom being represented and becoming a member of the Union. In 1875 the Imperial Parliament passed the Post Office Act of that year, giving legislative effect to the regulations agreed upon at the Convention. In 1876 British India was admitted as a member of the Union with a separate vote; and in 1878 the Dominion of Canada was admitted with similar rights. In 1890, the opinion of the then law officers was taken by the Government as to the legal right of the Postmaster General to establish rates of postage lower than those sanctioned by the Postal Union—

1. With foreign countries;
2. With Colonies who were parties to the Convention; and
3. With Colonies not parties to the Convention.

The law officers advised that the Imperial Parliament was not entitled to establish such lower rates of postage either with foreign countries or with Colonies parties to the Convention; but that they could establish rates with Colonies not parties to the Convention without regard to the regulations of the Postal Union. In the opinion of the then law officers the consent of the Colonies parties to the Convention did not affect the right of the Imperial Government in this respect.

In 1891 the Australasian Colonies were admitted to a separate representation with a single voice in the Union, but they only agreed to join the Union on an express guarantee being given to them that the 2½*d.* rate should not be modified until after the next meeting of the Congress in 1897. This guarantee was given by the Congress, and was agreed to by the representatives of Great Britain. The Convention was ratified by the Postmaster General and the Act of Ratification was sent by the Foreign Office to Her Majesty's Ambassador at Vienna, where it was deposited in the archives of the Imperial and Royal Ministry for Foreign Affairs.

(*b.*) *The Conditions on which the Australasian Colonies joined the Postal Union.*

As recorded in the Proceedings of the Vienna Congress of 1891 (pages 381–3), the First Committee of Congress, entrusted to consider and revise the main Convention of the Union and its detailed regulations, appointed a Sub-Committee to ascertain upon what terms the Australasian Colonies would enter

the Union. The following paragraphs are from the Sub-Committee's report:

"MM. les représentants de l'Australasie ont declaré qu'après avoir, dans la mesure du possible, cherché à obtenir une solution conforme à leurs instructions, ils ne croyaient pas devoir résister plus longtemps au vœu général et qu'ils allaient, en conséquence, solliciter de leurs Gouvernements l'autorisation d'adhérer à l'Union Postale avec une voix unique. Ils ont demandé toutefois à être préalablement prémunis contre une modification immédiate tant du taux du transit maritime que de la taxe générale de 25 centimes par 15 grammes ..."

"The representatives of Australasia stated that, after having sought to obtain as far as possible, a solution in accordance with their instructions, they did not think that they ought to resist longer the general wish, and that, consequently, they were about to apply to their Governments for authority to adhere to the Postal Union with a single vote. They demanded, however, to be guaranteed in the first place against an immediate modification, not only of the sea transit rates, but also of the general postage rate of 25 centimes per 15 grammes ..."

"La Sous-Commission ... a l'honneur de proposer à la 1re Commission de recommander au Congrès postal d'agréer l'accession des colonies d'Australasie à l'Union Postale Universelle. Il est entendu que les prix de transit maritime et la taxe de 25 centimes par 15 gr. seront maintenus aux taux actuels, sauf révision par le prochain Congrès."

"The Sub-Committee ... has the honour to propose to the first Committee that the Congress be recommended to accept the entry of the Colonies of Australasia into the Universal Postal Union. It is understood that the sea transit rates and the postage rate of 25 centimes per 15 grammes shall be maintained at the present fixed rate, unless revised by the next Congress."

When these conditions were laid before the Congress (Proceedings, pages 643-6), a declaration from the representatives of Australasia was read. It contains the following paragraphs:—

"En exécution des instructions de nos Gouvernements respectifs, nous soussignés déclarons que l'Australasie entrera dans l'Union Postale Universelle aux conditions convenues avec la Sous-Commission le 22 Mai 1891, à savoir que ces colonies auront toutes ensemble une voix distincte dans les Congrès et dans les affaires de l'Union, et que les droits de transit pour les transports maritimes seront maintenus sans changement jusqu'après le prochain Congrès quinquennal."

"Il est entendu en outre que la taxe des lettres de 25 centimes par 15 grammes ne sera pas modifiée pendant la même période et que les colonies australasiennes auront le droit de maintenir ou d'établir entre elles des tarifs postaux inférieurs à ceux fixés par la Convention de l'Union."

"Sous réserve de l'approbation des divers Gouvernements intéressés, nous fixons au 1er Octobre 1891 la date à laquelle les colonies susnommées entreront dans l'Union."

"In pursuance of the instructions of our respective Governments, we the under-signed declare that Australasia will enter the Universal Postal Union on the conditions arranged with the Sub-Committee of the 22nd of May 1891, namely, that these Colonies shall enjoy together a single distinct vote in the Congresses and in the affairs of the Union, and that the rates of transit for sea carriage shall be maintained without alteration until after the next quinquennial Congress."

"It is understood, moreover, that the postage rate for letters of 25 centimes per 15 grammes shall not be modified during the same period, and that the Australasian Colonies shall have the right to maintain or establish between themselves postal tariffs lower than those fixed by the Union Convention."

"Subject to the approval of the several Governments concerned, we fix the 1st of October 1891 as the date on which the above-named Colonies will enter the Union."

The terms were accepted by the Congress, and approved both by the British Government and by the Colonial Governments; and the Colonies entered the Union on the date fixed.

The

The compact is not limited to the letter postage between the Australasian Colonies and other parts of the Union, but extends to the postage between the various parts of the Union at large. The new intrants were protecting themselves against being forced, directly or indirectly, to lower further their own rates. They knew that the adoption of a lower rate than 2½*d.* between other distant parts would tend to force them in the same direction. That is why the stipulation was made in terms so general as to cover the whole Union. Hence, for England and her Colonies outside Australasia to set up penny letter postage, without the consent of the other parties to the compact, would be a breach of the engagement entered into.

(*c.*)—*Ratification of Vienna Convention, &c.*

The Postal Union Convention concluded at Vienna on the 4th of July 1891 and the Final Protocol thereto were formally ratified by Her Majesty's Postmaster General on behalf of the United Kingdom and all the British Colonies and Possessions in the Postal Union except India, Canada, and the Australasian Colonies, which are separate members of the Union.

The Act of Ratification was sent hence to the Foreign Office in December 1891, and thence to Her Majesty's Ambassador at Vienna, where it was deposited in the archives of the Imperial and Royal Ministry for Foreign Affairs.

After this ratification, the Australian Colonies availed themselves of Article III of the Final Protocol and signified their adherence to the Convention. That adherence was communicated to the Austrian Government diplomatically by Her Majesty's Government in accordance with Article V of the Protocol.

Finally, arrangements were made with the Secretaries of State for India and the Colonies for the ratification by them of the Convention and Final Protocol on behalf of India, Canada, and the Australian Colonies by means of Acts similar in form to that signed by the Postmaster General.

These Acts of Ratification do not expressly confirm anything beyond the Convention and Protocol, but the fact of such ratification having been given with the full knowledge of all that is implied by adhesion to the Convention would doubtless be held to commit the several Governments concerned to any bargain entered into by the delegates assembled at Vienna, even though such bargain were not embodied in the Convention or Protocol. Moreover, the reserve to the Australian Colonies of the right to enter in accordance with their declaration made at the Congress must necessarily imply acceptance of the conditions on which they had consented to enter.

(*d.*) *Memorandum by Sir. H. Bergne upon the facts stated in the above case.*

I think it is clear that we could not reduce the rate until the next Postal Conference unless we get the unanimous consent of the parties to the Postal Union.

Although it may not be a matter of strict treaty obligation, it is a question of good faith in giving effect to an express and recorded engagement.

25 April 1893.

IV.—Instructions given to the Representatives of this Country on the Question of securing Freedom of Action.

At the present time, the lowest rate chargeable for any letter sent beyond the shores of the United Kingdom is 2½*d.*, save in the solitary instance of letters addressed to or sent by seamen and soldiers serving Her Majesty abroad. In that case a privileged rate of 1*d.* is prescribed by Act of Parliament in certain conditions; but there are very grave objections to the extension of such a rate to the public at large.

It seems, moreover, in the last degree unlikely that the Congress would favour the assimilation of Colonial letter postage to Inland rates; but it is possible, though by no means a matter of course, that this Department might obtain at Vienna such a modification of the Convention as would allow any country of the Postal Union, which has colonies belonging to the Union, to apply to its relations with such colonies reduced rates provided they exceed its Inland rates of postage.

The British delegates are to use their best endeavours at the Congress to obtain such a relaxation of the terms of the Convention as would admit of this step.

General Post Office,
20 June 1893.

S. A. Blackwood,
Secretary.

POSTAL CONGRESS OF VIENNA, 1891.

COPIES of the Proceedings of the Sub-Committee of the Vienna Postal Congress of 1891 relative to the conditions on which the Australasian Colonies were admitted to the Postal Union; of the Papers submitted to the Foreign Office respecting the right of this Country, having regard to Covenants entered into at the said Postal Union Congress, to reduce or alter the amount of Postage chargeable on Letters sent to the Colonies, and of the opinion thereon; &c.

(*Mr. Henniker Heaton.*)

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Treasury Chambers, 21 April 1893.

JOHN T. HIBBERT.

(*Mr. Jackson.*)

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186.

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Barnard Castle	Barnard Castle and Teesdale Benefit Building Society.
Barnoldswick, Colne	Yorkshire Penny Bank.
Berkhamsted	Berkhamsted Mutual Building Society.
Black Heath, Dudley	Black Heath Coffee House Permanent Money Society.
Bourton-on-the-Water, Moreton-in-Marsh	Capital and Counties Bank.
Burbage, Buxton	Burbage Permanent Building Society.
Callington, Plymouth	Dingley and Co.'s Bank.
Camelford	Consolidated Bank of Cornwall.
Carlisle-street, Cardiff	(1.) Cambria's Pride Lodge Manchester Unity of Oddfellows. (2.) Bristol, West of England and South Wales Provident Society.
Chagford, Newton Abbott	Dingley and Co's Bank.
Chapel-en-le-Frith, Stockport	(1.) Guardian Fire and Life Insurance Company. (2.) Norwich Accident Insurance Company.
Cheddington, Tring	Liverpool and London Globe Insurance Company (Fire Department).
Clacton-on-Sea, Colchester	(1.) Norwich Union Life Insurance Society. (2.) Norwich and London Accident Insurance Association.
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Cricklade	Capital and Counties Bank.
Croston, Preston	Royal Insurance Society.
Crouch End, Hornsey, N.	Starr Bowkett Building Society.
Dymchurch, Folkestone	National Deposit Friendly Society.
Easingwold	Yorkshire Banking Company.
Edenderry, King's County	British Law Fire Insurance Company.
Furner's Green, Uckfield	Uckfield Permanent Building Society.
Fochabers	Union Bank of Scotland.
Gosforth, Carnforth	Cumberland Union Banking Company.
Haddenham, Thame	Wesleyan Assurance Society.
Hart-street, Southport	Provident Association of London.
Hilgay, Downham	(1.) Phœnix Fire Office. (2.) Provident Association of London.
Holbeach	Stamford, Spalding and Boston Banking Company.
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Hurst Brook, Ashton-under-Lyne	Private Money Lending Business.
Horsforth, Leeds	Leeds Provincial Building Society.
Idle, Bradford	Bradford Old Bank.
Innellan, Greenock	Clydesdale Bank.
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Nooklands, Preston	Law Accident and Contingency Insurance Society.
Northfleet, Gravesend	Northfleet Starr Bowkett Building Society.
Ore, Hastings	Red Lake Penny Bank.
Philipstown, Tullamore	English and Scottish Law Life Insurance Society.
Pinner, Watford	(1.) United Kingdom Provident Institution. (2.) Sun Fire Insurance Office. (3.) Scottish Accident Insurance Company.
Porlock, Taunton	Stuckey's Banking Company.
Portknockie, Aberdeen	The Caledonian Fire and Life Insurance Company.
Pudsey, Leeds	Leeds Provincial Building Society.
Prees, Whitchurch	Hawkstone Friendly Society.
Queen's Cross, Wells	Salvation Army Bank.
Red-lane, Coventry	Refuge Assurance Company.
Rhayader	Kington and Radnorshire Bank.
Rothbury	Hodgkins, Barnett and Co.'s Bank.
Rusthall, Tunbridge Wells	Industrial Prudential Life Insurance Society.
Saltash	Devon and Cornwall Bank.
Sanquhar, Cumnoch	Sanquhar District Savings Bank.
Seaham Harbour, Sunderland	Royal Fire and Life Insurance Company.
St. John's Chapel, Darlington	T. Backhouse and Co.'s Bank.
South Lowestoft, Lowestoft	(1.) Scottish Temperance Insurance Company. (2.) Commercial Union Life Insurance Office.
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West-hill, Dartford	Provident Association of London.
West Linton, Penicuick	Bank of Scotland.
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20 April 1893.

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Local Government Board,
17th April, 1893.

HUGH OWEN,
Secretary.

NUMBER of specified ERRORS and IRREGULARITIES discovered in the CERTIFIED COPIES of REGISTERS OF MARRIAGES for the Year 1891, deposited with the Registrar General by Clergymen of the Established Church.

1.	Entries unsigned by the persons married or by one of them - -	71
2.	Entries unsigned by the witnesses of the Marriage or signed by only one such witness - - - - - - - - - -	137
3.	Entries unsigned by the Clergyman officiating at the Marriage -	264
4.	Signatures in the spaces for Bride and Bridegroom by Persons whose names are not those of the persons purporting to have been married - - - - - - - - - - - -	13
5.	Entries which do not contain the date of the Marriage - - -	77
6.	Entries which fail to show the place where the Marriage was performed - - - - - - - - - - -	748

In the year 1891, 158,439 Marriages were solemnized according to the rites of the Established Church.

Brydges P. Henniker,
Registrar General.

REGISTER OF MARRIAGE ERRORS.

RETURN showing for the Year 1891 the Number of Cases in which each of the following ERRORS and IRREGULARITIES occur on the CERTIFIED COPIES of REGISTERS OF MARRIAGES deposited with the Registrar General by Clergy of the Established Church: &c.

(*Mr. Picton.*)

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FUTURE ORGANISATION OF THE OFFICE OF THE REGISTER OF DEEDS;

AND

FIXING THE SCALE OF GRATUITIES TO BE AWARDED, ON RETIREMENT, TO THE ENGROSSING CLERKS SERVING IN THE VARIOUS DEPARTMENTS OF THE REGISTER HOUSE.

Presented to both Houses of Parliament by Command of Her Majesty.
1893.

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1893.

[C.—7183.] *Price* 1*d.*

MINUTE of the SECRETARY FOR SCOTLAND regulating the future organisation of the Office of the Register of Deeds, and fixing the Scale of Gratuities to be awarded, on Retirement, to the Engrossing Clerks serving in the various Departments of the Register House.

I.—PRELIMINARY.

The Secretary for Scotland has had under consideration the Report of the Committee appointed to inquire into the office and establishment of the Register of Deeds.

He desires, in the first place, to express his entire satisfaction with the manner in which the Committee have discharged the duty entrusted to them, and the comprehensive and exhaustive character of the inquiries, the results of which are embodied in their Report dated August 1892.

The authorised staff at the date of the Committee's Report consisted of :—

1 Keeper	500*l.*
2 Assistant Keepers	350*l.* each.
1 Chief Clerk	80*l.* to 250*l.*
1 Cashier	80*l.* to 250*l.*

The last two mentioned officers also received an additional allowance of 15*l.* per annum, in respect of the additional hour of daily attendance.

The Secretary for Scotland will now record his decision on the various points relating to the Staff of the Office which were referred to, and dealt with by, the Committee in their Report.

II.—REORGANISATION OF PRESENT STAFF.

The Secretary for Scotland agrees with the view expressed by the Committee, that it is unnecessary to add to the number of the above-mentioned staff.

On the subject of the future salaries and allowances, the Secretary for Scotland has been in communication with the Lords Commissioners of Her Majesty's Treasury, in whom the power to fix the salaries and emoluments of the Office of Deeds is vested.

No change will be made in the salary of the Principal Keeper. That office will be a staff appointment to be filled by selection from the staff of the Register House Departments, unless, on the occasion of a vacancy, the Secretary for Scotland receives a written report from the Deputy Clerk Register that a thoroughly competent person cannot be thus obtained for the post. The vacancy in the office of Assistant Keeper occasioned by the retirement of Mr. George Young will not be filled up, and the staff, other than the Keeper, will consist of :—

1 First-Class Clerk	300*l.* to 400*l.*
3 Second-Class Clerks	80*l.* to 250*l.*

The first clerk will rise by yearly increments of 15*l.*; the three second-class clerks rising, after a satisfactory probation of one year, by yearly increments of 5*l.* to 100*l.*, and from that, if a favourable report is given by the Deputy Clerk Register, by 7*l.* 10*s.* a year to 190*l.* At this stage on a further satisfactory report certifying proved efficiency and fitness for higher work, which shall be approved by the Secretary for Scotland, the second-class clerks will rise by 10*l.* a year to a maximum of 250*l.*

The first-class clerk and the senior second-class clerk will continue to be designated Assistant Keepers. In consideration of this, and of the duty of signing extracts thus imposed on the senior second-class clerk, the officer holding that position will be entitled to an additional allowance of 30*l.* a year. The additional personal allowance of 30*l.* a year proposed to be given to Mr. J. Cameron, cashier, by the Committee for the reasons stated in their Report, is also sanctioned.

The Secretary for Scotland has further approved of the appointment of Mr. James Watson, of the Engrossing Staff, to the vacant second-class clerkship at a commencing

salary of 120*l.*, a Civil Service Certificate of qualification having been granted him under the provisions of the VIIth section of the Order in Council of 4th June 1870.

Promotion to the post of first-class clerk, in the event of a vacancy, will be made, subject to the approval of the Secretary for Scotland, from the second-class clerks, on the ground of merit alone, or of merit and seniority combined.

III.—Engrossing Clerks.

The position of the engrossing clerks, who are not on the establishment, has received the careful consideration of the Secretary for Scotland. In view of the rules of the Civil Service, it has not been found possible to amalgamate them with the body of established clerks, and they will accordingly be employed in the future, as in the past, on engrossing duty at the discretion of the Keeper, and will be paid by piecework. These clerks, will, however, be admitted to compete, along with others, at the entrance examination under the conditions prescribed in the next paragraph.

IV.—Conditions of Admission.

Admission to the Office will in future be by competitive examination among clerks who have served two years with a conveyancer in Scotland, or have been during the same period engrossing clerks in the Department. The subjects of examination and the limits of age for the candidates will remain as at present; but engrossing clerks now serving in the Department who may become candidates will be allowed to deduct their years of service, not exceeding ten, from their age at the time of competition, if in excess of the maximum limit.

The initial salary of engrossing clerks who may at some future time be successful in gaining admission to the establishment shall be 120*l.*, and such initial salary shall also be applicable to engrossing clerks on appointment to the permanent staff of the Sasines Office or the Record Office.

V.—Regulations as to Attendance, &c.

The assent of the Lords Commissioners of Her Majesty's Treasury has been given to the above classification and scale of salaries, which, in this respect, places the clerical staff of the Deeds Office in the same position as other Departments of the Register House, on the condition that a daily attendance of seven hours, in accordance with the general rule of the Civil Service, be given.

The regulations as to holidays, sick leave, and general administration will be those laid down by the Orders in Council for the Civil Service generally.

VI.—Gratuities to Engrossing Clerks on Retirement.

The Committee recommend that on the retirement or removal of an engrossing clerk, within the terms of the 4th section of the Superannuation Act, 1887, he should be allowed a gratuity in accordance with the provisions of that section. The Secretary for Scotland, with the concurrence of the Board of Treasury, sanctions a scheme under which gratuities in terms of the aforesaid section shall be granted to engrossing clerks upon their retirement, to be calculated on a salary of 120*l.* a year, or on the earnings of an engrossing clerk during a daily attendance of seven hours, calculated on an average of three years immediately preceding retirement. This scheme shall also apply to the engrossing clerks on the establishments of the Sasines Office and the Record Office.

VII.—Management of the Office.

The Committee recommend that, in future, the arrangements for the distribution of the work within the Office, which have hitherto been entirely in the hands of the Principal Keeper, shall be subject to the revision and approval of the Deputy Clerk Register, and that the rights of appointment and dismissal, which have also been hitherto exercised by the Principal Keeper, shall be subject to the Deputy Clerk Register's approval. The Secretary for Scotland approves of these recommendations, and, subject to any modifications affecting the same contained in this Minute, directs that they shall in future be observed.

The Committee also recommend that, on the occurrence of the next vacancy, the change referred to in the foregoing paragraphs should be emphasised by the alteration of the title of the Office from that of Principal Keeper to Deputy Keeper.

The Secretary for Scotland approves of and sanctions this recommendation.

The other recommendations of the Committee as to the arrangements for conducting the business of the Office, into which it is not necessary to enter into detail, have been referred to the Deputy Clerk Register and reported upon by him to the Secretary for Scotland, and, with his approval, have been duly carried into effect.

Approved,

(Signed) GEORGE OTTO TREVELYAN,
Her Majesty's Secretary for Scotland.

14th September 1893.

ROYAL PARKS AND GARDENS (KEW GARDENS).

COPY of RULES for KEW GARDENS and PLEASURE GROUNDS, dated 7th February 1893.

(*Presented pursuant to Act of Parliament.*)

KEW GARDENS AND PLEASURE GROUNDS.

RULES for KEW GARDENS and PLEASURE GROUNDS, in connection with the Regulations prescribed by "The Parks Regulation Act, 1872."

1. No person may ride or drive in these gardens and grounds. No truck, barrow, or cart may be brought into or used in them except for authorised purposes of service. No perambulator, velocipede, or other vehicle or machine is allowed to enter. Invalid chairs will be admitted when the state of the paths is suitable, with the written permission of the Director. Children under 10 years of age are not admitted unless accompanied by a parent or suitable guardian.

2. Visitors are to enter and leave the plant houses by the doors according to the notices affixed thereon. No person shall touch the plants in the plant houses. No unauthorised persons may remain in the houses or museums when closed to the public.

3. Smoking is not allowed in the plant houses or museums.

4. No unauthorised person shall drill, or practise military evolutions, or use arms, or play any game or music, or practise gymnastics, or sell or let any commodity in these gardens and grounds.

5. No large bags, baskets, or parcels may be brought in; artists and photographers may not bring in their apparatus without special permission from the Director.

6. Picnics and luncheon parties in the grounds are not allowed, but refreshments may be obtained at the pavilion.

7. No public address may be delivered in these gardens or grounds.

8. No dogs are admitted.

9. No person may walk on the grass edges of the walks.

10. Large parties must be broken up to prevent crowding.

11. The ornamental waters may not be used for any purpose.

12. Climbing the trees, railings, or fences is forbidden.

13. Birds' nesting, and taking, destroying, or injuring birds or animals are forbidden.

14. The distribution of hand-bills, advertisements, and other papers by the public is forbidden.

Dated the 7th day of February 1893.

Sealed with the Common Seal of the Commissioners of Her Majesty's Works and Public Buildings.

(signed) *H. W. Primrose*,
Secretary.

L.S.

ROYAL PARKS AND GARDENS
(KEW GARDENS).

COPY of RULES for KEW GARDENS and PLEASURE GROUNDS, dated 7th February 1893.

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[*Price* ½ *d.*]

65.

ROYAL PARKS AND GARDENS (NATURAL HISTORY MUSEUM GARDENS).

COPY of RULES, dated 30th July 1892.

(*Presented pursuant to Act of Parliament.*)

NATURAL HISTORY MUSEUM GARDENS.

RULES for the Gardens attached to the NATURAL HISTORY MUSEUM, in connection with the Regulations prescribed by "The Parks Regulation Act 1872."

1. No person may ride or drive in these gardens. No wheelbarrow, truck, velocipede, or other vehicles or machines, except bath chairs and perambulators, are allowed to enter.

2. No unauthorised person shall drill or practise military evolutions, or use arms, or play any game or music, or practise gymnastics, or take photographs, or sell or let any commodity.

3. No chairs or other seats may be placed for hire, except with the license of the Commissioners of Her Majesty's Works and Public Buildings and subject to the terms and conditions of such license.

4. No public address may be delivered in these gardens.

5. No dog shall be permitted to run at large within these gardens.

6. Climbing the trees, railings, or fences, and walking on the grass are forbidden.

7. Birds' nesting, and taking, destroying, or injuring birds or animals are forbidden.

8. The distribution of hand-bills, advertisements, and other papers is forbidden.

Dated the 30th day of July 1892.

Sealed with the Common Seal of the Commissioners of Her Majesty's Works and Public Buildings.

H. W. Primrose,
Secretary.

ROYAL PARKS AND GARDENS
(NATURAL HISTORY MUSEUM GARDENS).

COPY of Rules, dated 30th July 1892.

(*Presented pursuant to Act of Parliament.*)

Ordered, by The House of Commons, *to be Printed,*
14 *February* 1893.

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90, West Nile-street, Glasgow; or
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[*Price* ½*d.*]

61.

COPY of RULES dated 30th July 1892.

(Presented pursuant to Act of Parliament.)

VICTORIA TOWER GARDENS.

RULES for the VICTORIA TOWER GARDENS, in connection with the Regulations prescribed by "The Parks Regulation Act 1872."

1. No person is allowed to drive or ride in these gardens, and no wheelbarrow, truck, velocipede, or other vehicles or machines, except bath chairs and perambulators, are allowed to enter.

2. No person shall drill or practise military evolutions, or use arms, or play any game or music, or practise gymnastics, or take photographs, or sell or let any commodity.

3. No public address may be delivered in these gardens.

4. No dog shall be permitted to run at large within these gardens.

5. Climbing the trees, railings, or fences is forbidden.

6. Birds' nesting, and taking, destroying, or injuring birds or animals are forbidden.

7. No person may walk on the lawns.

8. The distribution of hand-bills, advertisements, and other papers is forbidden.

Dated the thirtieth day of July 1892.

Sealed with the Common Seal of the Commissioners of Her Majesty's Works and Public Buildings.

H. W. Primrose,
Secretary.

Seal of the Commissioners of H.M.'s Works and Public Buildings.

ROYAL PARKS AND GARDENS (VICTORIA TOWER GARDENS).

COPY of RULES, dated 30th July 1892.

(*Presented pursuant to Act of Parliament.*)

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[*Price* ½ *d.*]

60.

STILL-BIRTHS IN ENGLAND AND OTHER COUNTRIES.

RETURN to an Address of the Honourable The House of Commons, dated 9 May 1892;—*for*,

"RETURN from the United Kingdom, France, Spain, Germany, Austria-Hungary, Italy, Russia, Norway, Sweden, Denmark, Canada, Australia, New Zealand, and the United States, specifying the following Information with regard to each Country:—

1. Whether the Registration of Still Births is compulsory; and, if so, what Act regulates this;
2. Is the Registration carried out by the Authorities who register ordinary Births and Deaths;
3. Are Still Births registered as Births or Deaths, or both;
4. What is the Legal Definition of a Still Born Child;
5. What are the Penalties for neglecting to register a Still Birth;
6. Is the Number of Still Born Children, interred and registered in the year 1890, known; and, if so, what was such Number;
7. What are the Penalties for criminally causing a Child to be Still Born;
8. Copy of Regulations and Forms of Certificates used in registering Still Births;
9. Is a Certificate of Still Birth, signed by a Midwife, accepted by the Registering Authorities;
10. Are Midwives recognised by the State, and is the bulk of the Midwifery Practice in their hands;
11. Under what Regulations, if any, are Midwives allowed by the State to practise;
12. Is it known, and, if so, what is the Rate per 1,000 of Women who die in their Confinements or in the Four Weeks immediately following."

(*Viscount Grimston.*)

Ordered, by The House of Commons, *to be Printed*,
21 *June* 1893.

LONDON:
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RETURN from the United Kingdom, France, Spain, Germany, Austria-Hungary, Italy, Russia, Norway, Sweden, Denmark, Canada, Australia, New Zealand, and the United States, specifying the following Information with regard to each Country :—

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8. Copy of Regulations and Forms of Certificates used in registering Still Births ;
9. Is a Certificate of Still Birth, signed by a Midwife, accepted by the Registering Authorities ;
10. Are Midwives recognised by the State, and is the bulk of the Midwifery Practice in their hands ;
11. Under what Regulations, if any, are Midwives allowed by the State to practise ;
12. Is it known, and, if so, what is the Rate per 1,000 of Women who die in their Confinements or in the Four Weeks immediately following.

— 1. —

UNITED KINGDOM.

ENGLAND AND WALES.

1, 2, and 3. No system of registration of stillbirths is carried out in England and Wales.

4. There appears to be no legal definition of "stillborn." In Section 18 of the 37 & 38 Vict. c. 88, the meaning seems, from the context, to be "not born alive."

5. *See* reply to 1, 2, and 3.

6. The number of stillborn children interred during the year 1890 in Burial Board cemeteries in England and Wales was 17,335. The number interred in other burial grounds during the year 1890 is not known.

7. For procuring abortion, the punishment is penal servitude for life, or for any less term, or imprisonment.
Where there is no procuring of abortion, the killing a child in the act of birth and before it is fully born is not an offence by the present law, although if injuries are inflicted before birth which cause the child's death after birth, the law of murder applies.

8 and 9. *See* reply to 1, 2, and 3.

10. Midwives are not recognised by the State.
On high medical authority, it is stated to be estimated that two-thirds of the midwifery practice in England and Wales is in the hands of midwives ; but the facts are not officially known. The estimate above referred to is based on the results of investigations made in 1869, which were published in Volume XI. of the Transactions of the Obstetrical Society.

11. *See* reply to first part of 10.

12. The Registrar General has no information as to the rate per 1,000 of women who die in their confinements, or in the four weeks immediately following.

SCOTLAND.

1. There is no registration of stillbirths in Scotland, either under Act of Parliament or otherwise.

2. No. *See* Answer 1.

3. *See* Answer 1.

4. A "stillborn child" does not appear to have been defined by Act of Parliament, but it is understood to mean a child who has never breathed after parturition.

5. *See* Answer 1.

6. The number of stillborn children interred and registered in the year 1890 is not known.

7. Criminally causing a child to be stillborn falls under the crime of "Procuring Abortion," the punishment for which, on conviction, is arbitrary.

8. *See* Answer 1.

9. *See* Answer 1.

10. Midwives are not recognised by the State, but practise on their own responsibility. The extent of their practice is not known.

11. There are no State regulations with regard to midwives.

12. According to the Registrar General's Detailed Annual Report of Births, &c., in Scotland for 1889 (being the last Report), the number of women who died from child-birth diseases was 623, or 17 per 1,000 of the total deaths (females). The number of women who die in the four weeks immediately following confinement is not known.

(signed) *Jas. Auldjo Jamieson*,
Crown Agent.

Crown Office, Edinburgh,
27 June 1892

IRELAND.

1. The registration of stillbirths is not compulsory. Stillbirths are not registered in Ireland, either compulsorily or voluntarily.

2. *See* No. 1.

3. As neither. *See* No. 1.

4. A child is born alive, when it exists as a live child, breathing and living by reason of breathing through its own lungs alone, without deriving any of its living or power of living by or through any connection with its mother. Though the umbilical cord be unsevered, it may still be a living child. Any child which does not answer this description is stillborn. There is no other legal definition of a stillborn child.

5. There are not any penalties. *See* No. 1.

6. The number in Ireland is not known.

7. It is difficult to conceive any act or attempt made to procure the birth of a child stillborn, which would not be punishable, as the procuring of abortion, or attempting to procure it, under 24 & 25 Vict. c. 100, Secs. 58 and 59, and 27 & 28 Vict. c. 67, Sect. 2, with penal servitude for life, or not less than 5 years, or imprisonment with hard labour for any time not exceeding 2 years.

8. There are no such forms in use.

9. There is no such regulation; such is not necessary in the present state of the law.

10. Midwives are not recognised by the State. It would be impossible to say what portion of the midwifery practice is in the hands of midwives in Ireland, but a large proportion of it is so.

11. There are no State regulations with regard to midwives.

12. The average annual number of deaths from the "Accidents of Childbirth" registered in Ireland during the 10 years, 1881–90, was 488, and the average annual number from "Puerperal Fever" for the same period was 325, the total under both headings being 813, or 7·1 per 1,000 of the average annual number of births registered, but the number of the deaths which occurred within four weeks after confinement cannot be stated from the published reports.

— 2. —

(The following information respecting stillbirths and midwifery in European countries has been obtained from Her Majesty's representatives abroad, through the medium of the Foreign Office.)

FRANCE.

ANSWERS to Questions upon the subject of Stillbirths and the practice of Midwifery in France.

1. The Decree of the 4th July 1806 renders the registration of stillborn children on the registers of the Civil Estate compulsory.

2. The Registrar of Births and Deaths is the official whose duty it is to draw up the deed of registration of a stillborn child.

3. In pursuance of the terms of Article 2 of the Decree of 4th July 1806, the deed of registration is only entered in the Register of Deaths. The object of the decree not being to ascertain if the child was born dead or alive, the Registrar is only bound to register the fact that the dead body of the child was produced before him, and the entry is therefore made in the death register alone, without any mention being made as to whether the child was born dead, or whether it had died after its birth.

4. There is no real legal definition of a stillborn child; since by Article 55 of the Civil Code, the birth of a child must be registered within three days after it has been brought into the world, it follows that a large number of children that have breathed, or even lived till the third day, are registered as stillborn, or at least as having been presented to the Registrar of Deaths without life, and they are consequently included in the lists of stillborn children. Such births may therefore be described as those of children presented without life to the Registrar of Deaths, and whose births have not been registered. From this it will be seen that statistics of stillbirths should properly be divided into two classes: (1) stillborn children, and (2) children which have died before their birth has been registered.

It would moreover appear, from a decision of the Court of Besançon of the 31st October 1844, that the registration of a stillbirth is held by French jurisprudence to include, not only children who have been the full term in the womb, but all such as are born sufficiently formed for it to be possible to declare the sex.

5. Non-declaration of a death is not punishable by French law, which limits itself to declaring the nature of the penalty which may be inflicted upon a person who, having been present at a birth, does not make the declaration laid down by the 56th Article of the Civil Code, before the expiration of the delay fixed by Article 55 of the same Code; namely, from 6 days to 6 months imprisonment, and a fine of not less than 16 francs, and not more than 300 francs (Article 346 of the Penal Code). The jurisprudence has established, however, almost unanimously, that the death of a child at the moment of its birth does not free the people designated by the law from the duty of declaring the birth. The Decree of the 4th July 1806 which prescribes the inscription of such birth in the death register in no way modifies the obligations which result from Articles 55 and 56 of the Civil Code, and Article 346 of the Penal Code (Cour de Cassation, 2nd September 1843, 2, Août, 1844, and 27 Juillet 1872.)

Again, Article 347 of the Penal Code, punishes with the penalties attached to Article 346, any person who, having found the dead body of a child, does not cause it to be brought to the Registrar of Deaths.

6. It is shown by the statistics of children born dead in France in 1890, that they numbered 40,535, that is to say, a proportion of 4·6 per cent. But it must be born in mind, as stated above, that these figures include children who died before the expiration of the legal three days' delay, in which a birth must be registered.

In Paris the total number of births was 57,787 in 1890, and the number of children registered as born without life amounted to 4,239 (2,327 boys and 1,912 girls), which gives a percentage of 7·33.

7. By Article 317 of the Penal Code, whoever, by means of food, drink, medicaments, violence, or by any other means, shall procure an abortion, whether with or without the consent of the woman with child, shall be punished by solitary confinement.

The same penalty shall be pronounced against a woman who herself procures an abortion, or who, having consented to make use of means indicated to her or administered to her for the purpose, shall have procured an abortion. Doctors, surgeons and other health officers, as also chemists, who shall have either indicated or administered such means shall be condemned to a limited period of hard labour, if the abortion has taken place.

FRANCE—*continued.*

8. Decree of 4th July 1806. No. 104. This Act must be entered on the registers of deaths.

In the year eighteen hundred and the (month) at o'clock .m., before us (name and surname), mayor and registering officer of the commune of in the district of , in the department of , appeared, in the joint house of (name and surname of man), aged . years, (trade or calling), and (name and surname of woman), aged years, (trade or calling), both domiciled at , who brought before us a lifeless child of sex, declaring that this child was born of (name and surname of man), one of the persons appearing, and of , (name and surname of woman), aged years, (trade or calling), his wife, living with him, and that this child issued from the mother's womb yesterday at o'clock, .m., of which presentation and declaration we have taken act in these presents, which, having been read, have been signed by the persons declaring together with ourselves.

9. No certificate at all is required, but if there was any doubt as to the cause of death, midwives possessing certificates, might be called on to give evidence. No official information furnished in answer to this question.

10. Midwives or "sages femmes" are certainly recognised by the State, says a leading English doctor, if they have passed their regular curriculum or examination. They have nearly the same rights, he continues (as regards confinements), as regular authorised doctors except that they may not make use of instruments except in the presence of a doctor. The same physician adds that it is difficult to say if the bulk of the midwifery practice is in the hands of the "sages femmes" or not, but he gives it as his opinion that such is the case.

No official information received.

11. The exercise of the profession of midwife in France is chiefly regulated by the new medical law of 30th November 1892, by virtue of which midwives will, for the future, only be recognised if they are provided with a diploma furnished by the French Government, after they have passed certain examinations. They are not allowed to make use of instruments, nor prescribe medicines except under certain specified circumstances. In cases of laborious childbirth they are bound to call in a medical physician.

Infringements of the law are to be brought before the Tribunals, and are punishable by fines, and in cases of repeated offences, by imprisonment.

Note.—Her Majesty's Ambassador at Paris states that the diplomas furnished to midwives by the French Government are of two descriptions. A diploma of the First Class empowers the midwife to practise in any part of France, whereas one of the Second Class only authorises her to practise in the department for which it is issued.

12. No information has at present been procurable in answer to this question.

Note.—Her Majesty's Ambassador has been unable to procure any official information with regard to Questions 9, 10, and 12.

SPAIN.

REGULATIONS in force respecting Stillbirths and Midwifery in Spain.

1. The registration of stillbirths is not compulsory, but for the purpose of burials the Royal Order of 30th January 1871 was issued, in which it is laid down that registration is not necessary, and that in order to comply with Article 75 of the Law of Civil Registration, so far as it relates to burial, the proper medical certificates must be presented to the municipal court, stating the hour at which the miscarriage took place; of what period it was, approximately; the sex, if known; the name, surname and domicile of the woman, and of the husband, if there be one; and that a special register for these cases must be kept at the municipal courts, called "The Register of Stillbirths" (Legajo de Abortos).

2. The registration is carried out by the ordinary authorities in the municipal courts in which "The Registers of Stillbirths" referred to in the first answer are kept.

3. Stillbirths are registered only for the purpose of burial in the manner indicated in the first answer.

4. A stillborn, as opposed to a live born child, is one born six months and one day from the presumable time of conception. From a medical point of view, stillborn (*feto*) is the term used to designate in the human species the product of conception at a certain period of gestation. From a legal point of view, stillborn is understood to specify any product of gestation which has lived less than 24 hours outside the womb. For the purposes of the penal code, no products of gestation which have breathed are considered stillborn.

5. The

SPAIN—*continued.*

5. The penalty imposed by Article 75 of the Law of Civil Registration, 20 to 100 pesetas, is incurred when a stillbirth is buried without the conditions laid down in the Royal Order of the 30th of January above mentioned being fulfilled.

6. In the year 1890 the number of stillborn children interred and registered in Madrid was 1,229; the total number in Spain being 7,830.

7. The penalties for criminally causing a child to be stillborn are specified in Articles 425, 426, 427 and 428 of the Penal Code, which are as follows:

"PENAL CODE.—Chapter VI.—Abortion.

ARTICLE 425.

Whosoever wilfully causes an abortion shall be punished.

1st. With the penalty of temporary imprisonment (12 years and one day to 20 years), if violence was made use of on the pregnant woman.

2nd. With the penalty of from six years and one day to 12 years' imprisonment (*prision mayor*), even if without using violence, the act was done without the consent of the woman.

3rd. With the penalty of corrective imprisonment of from two years four months and one day to four years and two months (*grado medio*); or from four years two months and one day to six years (*grado maximo*), if the woman consented.

ARTICLE 426.

The penalty of corrective imprisonment (six months and one day to two years and four months (*grado minimo*) or two years four months and one day to four years and two months (*grado medio*), when abortion is caused by violence although without intention to cause it.

ARTICLE 427.

The woman who causes her own miscarriage or consents to its being caused by another person, shall be punished with corrective imprisonment for two years four months and one day to four years and two months (*grado medio*); or, four years two months and one day to six years (*grado maximo*).

If she does it in order to hide her dishonour, she shall incur the penalty of corrective imprisonment for six months and one day to two years and four months (*grado minimo*), or two years four months and one day to four years and two months (*grado medio*).

ARTICLE 428.

A medical man who misuses his art to cause an abortion or co-operate in doing so, shall incur the penalties specified in Article 425 according to the nature of the case, but in the most severe form (*grado maximo*).

The chemist who, without a proper medical prescription, sells a medicine calculated to cause an abortion, shall incur the punishment of imprisonment for one month and one day to six months (*arresto mayor*); and a fine of one hundred and twenty-five to one thousand two hundred and fifty pesetas."

8. No form of burial certificate is in use; all that is required of medical men is that they should in certifying comply with the conditions of the Royal Order of the 30th of January 1871, of which the following is a translation:

"MINISTRY of Grace and Justice.

In view of the "Expediente" formed in consequence of the inquiry addressed by you to this ministry regarding the manner of registering stillbirths; and in view of the order drawn up by you that a temporary register entitled the "Register of Stillbirths" should be opened and stillbirths inscribed therein, seeing that a stillbirth cannot be inscribed in either the Register of Births or the Register of Deaths; and in view of Articles 1 and 75 of the Law of Civil Registration: seeing that according to the aforesaid Article 1, the Register is to be used only for the inscription of, or entries regarding, acts connected with the civil condition of persons; and seeing that according to the existing law a person in the legal acceptation of the term is only one who is capable of exercising rights and incurring obligations, and that capacity of this nature is not and cannot be possessed by a stillborn child, since it is indispensable for the acquisition thereof that a child should be born alive and should live separate from its mother's womb for 24 hours, for which reason the registration of a stillborn child in the Civil Register is not admissible; and, seeing that a stillbirth must, notwithstanding, be interred, and that this cannot take place without the competent permission of the municipal judge, according to Article 75 cited above; His Majesty the King has been pleased to order that, as a general rule for all cases of this kind.

Answer to No. 8—*continued.*

1st. The registration of stillbirths is not necessary.

2nd. To comply with the provisions of Article 75 of the Law of Civil Registration, a medical certificate must be exhibited at the municipal court of the place stating the hour at which the miscarriage took place; of what period it was approximately; the sex, if known; the name, surname, and domicile of the woman who has had the miscarriage, and that of her husband, if she were married; and that this certificate having been given and placed in the archives in the Register entitled the "Register of Stillbirths" (*Legajo de Abortos*), the necessary permission shall be issued for the burial to take place. By order of His Majesty I state this to you for your information and guidance as may be needful. God preserve you many years. Madrid, 30th January 1891. To the Senior Judge of First Instance of Barcelona."

ARTICLE 75 of the Law of Civil Registration is as follows:—

"No burial can be allowed without having previously registered the death in the corresponding Book of the Civil Register in the municipal district where the death occurred, or in that of the district where the corpse lies; neither without the judge of the municipal district having issued the licence for burial, nor without 24 hours having elapsed since that stated in the medical certificate.

This licence shall be written on ordinary paper and no fee shall be levied for it.

The man who being in charge of a cemetery buries a corpse without the aforementioned licence, and those who may have disposed or authorised the burial, shall be liable to a fine of from 20 to 100 pesetas, which the corresponding municipal judge shall levy."

9. Midwives being regarded merely as auxiliaries, and authorised only to take charge of normal childbirths, cannot sign a certificate of this kind.

10. The State recognises midwives only as trained auxiliaries (*auxiliares facultativos*). It is not known to the authorities at the Spanish Home Office whether the bulk of midwifery practise is in the hands of such persons or not.

11. Midwives are allowed to practise under the Law of Public Instruction of 1857, and Regulations of the 21st November 1861, which are as follows:—

"ARTICLE 41.—Law of Public Instruction, 1857.

The Regulations shall also determine the conditions under which the diploma of midwife may be obtained."

"REGULATIONS.—21st November 1861.

Midwives are allowed to practise after having passed their examination on the following points:—

1. Notions of obstetric especially in what relates to its anatomic and physiological part.

2. Phenomena of natural childbirth and lying-in, and symptoms distinguishing these from the preternatural and laborious.

3. Principles and rules to assist parturients and women lately delivered and to newborn babies in all cases within the normal and physiological state.

4. First and urgent aid of the art to babies when they are born asphyxiatic or apoplectic.

5. Manner to administer to babies the baptismal water when their life is in danger.

ARTICLE 2.

These studies shall be made at the establishments, hospitals, or benevolent institutions named by the rector of each university district; and the diploma shall be issued by the Director General of Public Instruction.

ARTICLE 12.

These studies shall be made, at least, in four half years. Lessons shall be daily, and shall last one hour and a-half.

ARTICLE 13.

The first half year shall be employed in acquiring preliminary ideas and notions: the two following, in developing them by means of convenient theoretical and practical studies; and the fourth and last in epitomising and making perfect the knowledge mentioned."

12. The total number of confinements in Spain from 1880 to 1884 was 2,520,392; and the deaths in, or in consequence of, confinements, 31,185, the time, however, not being strictly limited to the four weeks immediately following the confinement.

GERMANY.

Registration, &c., of Stillbirths in the German Empire.

1. The registration of stillbirths is compulsory in Germany, and is regulated by Section 23 of the Act, dated 6th February 1875, entitled "Ueber die Beurkundung des Personenstandes und die Eheschliessung." The Section in question runs as follows:—

> "When a child is born dead or dies in its birth, declaration thereof must be made at latest on the day next following. The entry is to be made in the Register of Deaths only with,
>
> (1.) First and family names, description or trade, and address of the informant.
>
> (2.) The place, day and hour of the birth.
>
> (3.) The sex of the child.
>
> (4.) First and family names, religion, description, or trade, and address of the parents."

The register entry is only to be couched in one of the two terms contained in the Section: "born dead," or "having died in its birth." This is to avoid any presumption that the child has actually lived, or the contrary. This is further evidenced by the injunction that the entry is to be made in the Register of Deaths only.

In all other cases of death, notification is ordered to be made "on the next week day following." In these cases, however, the words "on the next day following" are substituted, because it more frequently arises, in receiving notifications of stillbirths, that the Registrar deems it necessary to investigate suspicious circumstances, which investigation ought not to be delayed by the intervention of a Sunday.

2. The registration is carried out by the authorities charged with the recording of all Acts pertaining to marriages, births, deaths, &c.

3. Stillbirths are entered in the Register of Deaths only [*see* Answer 1.].

4. A legal definition of a stillborn child is nowhere given; the legislator has expressly abstained from elucidating this point. In science, only a viable fœtus is recognised as a "child," and in practice only a fœtus of seven months is considered to be capable of living. Before attaining that age they are regarded as being immature: the separation of such a fœtus (birth) need not be brought to the knowledge of the competent authorities, who would, moreover, reject an announcement of that kind.

5. The penalties for neglecting to register a stillbirth are imposed in the shape of fines, similar to those for omitting to effect other registrations. Section 68 of the Act aforesaid provides that any person neglecting to comply with the duties of notification prescribed in the Act is punishable with fines up to 150 marks, or with imprisonment. Such punishment, however, does not apply when timely notification is given, although not by the person whose immediate duty it is to give it.

The registrars are, moreover, authorised to compel, by means of fines, the persons concerned to make declarations or to execute other processes enjoined by this Act; such fines not to exceed 15 marks in each instance.

6. There are no statistical returns at present available from which it would be possible to ascertain the number of stillborn children interred and registered in the year 1890.

7. The penalties for criminally causing a child to be stillborn are stipulated in Sections 217 to 220 of the Imperial Penal Code (Reichs Strafgesetzbuch) which are as follows:

> "Section 217.—Any mother who murders with premeditation her illegitimate child at the time of, or immediately after its birth, is punished by imprisonment in a house of correction for not less than three years.
>
> In the presence of attenuating circumstances, simple imprisonment for not less than two years may be substituted.
>
> Section 218.—A pregnant woman who of premeditation procures abortion or causes the death of the child in her womb, is punished with imprisonment in a house of correction for a term not exceeding five years.
>
> In the presence of attenuating circumstances, simple imprisonment for not less than six months may be substituted.
>
> The same penalties are applicable to any person who, with the consent of the pregnant woman, has employed the means for bringing about the abortion or the murder, or has contributed to the same.
>
> Section 219.—Imprisonment in a house of correction for a term not exceeding ten years is the penalty assigned to any one who for a pecuniary consideration in the case where a pregnant woman has procured abortion or murdered her (unborn) child, has furnished the means for that end, has applied them or has been contributory thereto.
>
> Section 220.—Any person who, of premeditation, without the knowledge or consent of a pregnant woman, procures the abortion or the death of her (unborn) child, is punished by imprisonment in a house of correction for not less than two years.

Answer No. 7, *continued.*

In the event of the death of the pregnant woman being caused by such treatment, imprisonment in a house of correction for a term of not less than ten years, or for life, may be substituted."

8. The forms of certificates used in registering stillbirths are as follows:

REGISTRATION FORM A.

ENTRY concerning a child which has died at its birth, upon the faith of a declaration by the Midwife.

Berlin, 6 January 1876.

Appeared this day before the undersigned Registrar, the personally identified [by reason of an official document] midwife, widow Ida Friedemann, born Janke, residing in Berlin, No. 17, N—— street, and notified that on 5th January instant, at 3 p.m., at No. 67, A—— street, Berlin, the residence of the mother's husband, R. Naumann, hatter, of the Evangelical religion, a female child was born to Louise Naumann, born Müller, of the Evangelical religion, and that the said child died at its birth.

Mrs. Friedemann affirmed that she was present at the confinement of Mrs. Louise Naumann.

Read aloud, assented to, and signed.

(signed) *Ida Friedemann*, born Janke.

N. Registrar.

Note.—As all entries concerning stillborn children are made in the Register of Deaths only, the ordinary printed column used in registering deaths is crossed out upon the page employed. The entry itself is then written in the margin of the page and a note inserted that the ordinary printed column is so crossed out, with the exception of the first few words, which are applicable in both cases.

REGISTRATION FORM B.

ENTRY concerning the birth of a stillborn child, upon the faith of a declaration by the lawful Father.

Berlin, 1 February 1886.

Appeared this day before the undersigned Registrar, the personally identified [by reason of an official document] Gottfried Kuntze, musician, residing in Berlin, No. 22, S——street, and notified that, on the 31st of January Eighteen hundred and eighty-six, at the residence of the widow Abel, a dead male child was born to his lawful wife, Henriette Mary Kuntze, born Hofemüller, of the Catholic religion, residing with the informant, of the Evangelical religion, at No. 22, S——street, Berlin.

[The rest, with the signatures, as in Form A. In this case also the ordinary printed column of the page employed is crossed out, with the exception of the few words at the commencement, and the entry itself is written in the margin.]

9. Neither certificates of death nor certificates of stillbirth are requisite or admissible, as the Act provides that the announcement shall in each case be made personally by a witness. A midwife must personally appear before the Registrar, in order to effect a legal registration: a certificate does not suffice. It is not the duty of the Registrar to ascertain whether a child was stillborn.

10. In Germany, midwives are appointed, recognised, and authorised by the State to conduct childbirths independently, and without the assistance of a physician.

11. It is necessary, however, for midwives to be provided with a certificate of approbation from the police authorities, and such certificates are obtainable only after the candidates have passed a State examination.

Midwives must reside in special districts assigned to them by the authorities. They are under the supervision of an officially appointed physician, and the obligation is imposed upon them to make the proper declarations, particularly as regards all cases of puerperal-fever, and deaths of women in childbirth, occurring in their practice.

The regulations from which the foregoing are extracted, as also those governing the examinations of midwives, are contained in a Ministerial Edict, dated 6th August 1883. The clause relating to examinations runs as follows:—

"Those persons only are admissible to examination for practice as midwives who have undergone a complete course of instruction in a Prussian school of midwifery. Exceptionally, persons may be also admitted to examination who can show proof of a correspondingly valuable education as well as the necessary acquirements for reception into a Prussian educational institution."

Midwives

GERMANY—*continued.*

Answer No. 11, *continued.*

Midwives are further required by law to take the following Oath before they are admitted to practice :—

"In the name of God, &c., I swear that, to the utmost of my knowledge and power, I will practise the science of midwifery, will assist rich and poor with equal cheerfulness, and, above all, will so demean myself in every particular as is seemly and fitting for a true and conscientious midwife. So help me God."

12. There do not at present exist any Statistical Returns concerning the number of women dying in childbed, or within four weeks of their delivery, which would cover the whole territory of the German Empire.

The Federal States may be expected, in the future, to adopt identical forms of returns in regard to deaths, either in childbirth itself or resulting therefrom. The Returns hitherto collected in the several States are not arranged on a uniform plan. No comparison is therefore possible between them, or between them and the statistics obtained from Great Britain.

Comparative tables of the numbers of deaths in childbed, or from puerperal fever during the last decade, have been prepared by the Imperial Sanitary Bureau, for Volume III. of the Reports upon Medical Statistics : these tables relate to Prussia, Bavaria, Saxony, Baden, Hesse, and Hamburg.

Some extracts from them are annexed to this Memorandum.

MORTALITY amongst lying-in women taken in relation to the numbers of living and stillborn Children.

(A.) PRUSSIA.

Deaths in childbirth.

For every 10,000 children (living or stillborn) there died in childbirth :

YEAR.	WOMEN.
1880	54·7
1881	58·1
1882	59·3
1883	57·4
1884	56·0
1885	58·4
1886	55·9
1887	53·1
1888	46·0
1889	42·6
For the 10 years, 1880–89	54·1

(B.) BAVARIA.

Deaths resulting from advanced pregnancy and childbirth.

For every 10,000 children (born alive or dead) there died from advanced pregnancy or childbirth :

YEAR.	WOMEN.
1879	53·7
1880	54·3
1881	59·4
1882	56·5
1883	58·2
1884	62·6
1885	66·4
1886	64·4
1887	58·6
1888	57·4
For the 10 years, 1879–88	59·1

GERMANY—*continued.*

Answer No. 12, *continued.*

(C.) SAXONY.

Deaths from diseases of childbed.

For every 10,000 children (born alive or dead) there died from diseases of childbed:

YEAR.	WOMEN.
1883	68·3
1884	76·9
1885	74·4
1886	69·5
1887	61·0
1888	62·1
1889	64·2
1890	57·2
For the 8 years, 1883–90	66·6

(D.) GRAND DUCHY OF BADEN.

Deaths during the first 3 weeks after childbirth:

For every 10,000 children born (alive or dead) there died during the first 3 weeks after childbirth:

YEAR.	WOMEN.
1881	66·5
1882	75·3
1883	68·5
1884	76·1
1885	82·9
1886	77·0
1887	67·6
1888	73·9
1889	66·1
1890	67·4
In the 10 years, 1881–90	72·1

(E.) CITY OF HAMBURG.

Deaths in childbed.

Of every 10,000 women lying-in, there died:

YEAR.	WOMEN.
1881	63·4
1882	61·5
1883	73·0
1884	47·3
1885	61·0
1886	46·1
1887	61·5
1888	51·2
1889	52·2
1890	49·4
For the 10 years, 1881–90	56·3

GERMANY—*continued.*

Answer No. 12, *continued.*

EXTRACT.

DEATHS from Puerperal Fever in Prussian Towns, included in the Monthly Returns of Mortality issued by the Imperial Sanitary Bureau.

Proportion of Deaths from Puerperal Fever to every 10,000 Births (living or dead).

YEAR.	WOMEN.
1881	35·8
1882	35·0
1883	33·8
1884	31·9
1885	29·6
1886	28·0
1887	24·2
1888	24·1
1889	20·5
1890	20·1
For the 10 years, 1881–90	27·7

BAVARIA.

COPY Despatch from Her Majesty's Minister at Munich and Stuttgart.

My Lord, Munich, 27 May 1892.

I HAVE the honour to acknowledge the receipt of your Lordship's Despatch Circular of the 18th instant, instructing me to furnish replies to certain questions enclosed in your Despatch, for the Home Office, to be presented to Parliament, respecting stillbirths and midwives in Bavaria.

I have the honour to inform your Lordship thereupon, that stillbirths included in births, also deaths and marriages, and all registrations and laws in regard thereto, are subject and regulated by German Imperial law throughout all Germany. There is no special law for Bavaria. As the answers, therefore, to the questions forwarded will, naturally, be reported from Berlin, it is unnecessary that I should duplicate them.

As to information respecting midwives, I have the honour to enclose a copy of my Despatch of the 18th of March 1889, which contains every possible information thereupon to be obtained on the subject, and the regulations appertaining thereto. There has been no change in the Bavarian regulations since then.

I have given separately enclosed answers to those specific questions to which replies are not to be found in the information supplied in my above-mentioned Despatch.

I have, &c.
(signed) *Victor Drummond.*

The Right Hon. the Marquess of Salisbury, K.G.,
&c. &c. &c.

(Enclosure I.)

EXTRACT from Despatch from Her Majesty's Minister at Munich and Stuttgart.

My Lord, Munich, 18 March 1889.

I HAVE the honour to enclose to your Lordship herewith an extract in translation of the Bavarian regulations concerning the legal position, instruction, examination, and general duties of midwives in Bavaria.

There is also a handbook for midwives, which is used at each of the four schools of midwifery in Bavaria.

* * * * * *

I have, &c.
(signed) *V. Drummond.*

(Enclosure II.)

EXTRACT from the Bavarian Regulations concerning Midwives, 30th April 1874.

Midwives receive their education at public schools of midwifery in Munich, Wurzburg, Erlangen, and Bamberg.

The "personnel" in each of these schools consists of a director, a professor, and a repetitor.

The theoretical and practical instruction is given by the professor and repetitor, over whom the director exercises a general supervision.

Each course of instruction lasts four months. An abbreviation of this term is on no account admissible.

Each of the four schools of midwifery take in the candidates of the corresponding provinces and districts.

As a rule there shall not be more than 60 candidates working at the same time in the school at Munich, 50 at Wurzburg, 25 at Erlangen, and 35 at Bamberg.

If, however, the number of midwives falls short of the demand, the Local Governments are empowered to add to this number.

Women who wish to attend the above courses must produce :—

(*a*) School certificates in which it is shown that they can read, write, and calculate.

(*b*) A medical certificate of bodily and mental soundness.

(*c*) A police certificate of morality.

(*d*) A baptismal and birth certificate (the former in the case of Christians).

They must also show their ability to meet the expenses of subsistence during the duration of the course, of the requisite books, and of the instruments and appliances with which they are furnished after the examination.

The limit of age for admission to these courses is from 20 to 36, and no woman is admitted who has attained the second half of the period of pregnancy.

Candidates who wish to join the course must give three months' notice to that effect.

Preference is given to those persons who wish to carry on their profession with a view to become public or parish midwives, but if there be still room, those persons will also be accepted who wish to carry on their profession in a private capacity.

Every candidate has to undergo a preliminary examination (at the hands of the above-mentioned authorities) as to whether she is physically and mentally fit to follow the course, and eventually to pursue the profession of midwife.

If she fails to satisfy the examiners she may be refused admittance ; and if at any time during the first month the director is persuaded of her incapacity he is authorised to exclude her from further instruction.

Candidates who have passed the preliminary examination shall lay down, before the course of instruction commences, such a sum of money as is necessary for the purchase of the necessary books, and for the eventual purchase of the necessary instruments and appliances.

The course of instruction is given gratis.

After the course has begun no fresh candidates can be admitted except by the consent of the Local Government authorities.

The examination takes place at the close of the four months and is conducted privately.

The certificate of examination must be signed by the director and bear the seal of the school.

The names of the successful candidates are published in the local papers.

The examining body consists of the Governmental divisional physicians, the director, the professor, and the repetitor.

Candidates are examined not only in the theory but in the practice of midwifery. For this purpose lay figures are used.

The

GERMANY—BAVARIA—*continued.*

Regulations concerning Midwives—*continued.*

The three first candidates receive a gold medal.

Unsuccessful candidates recover the money which they deposited. They are allowed to present themselves at one more course of instruction.

In 1875 the following additional regulations came into force:

Midwives must avoid all pursuits which may exercise an influence prejudicial to the proper carrying on of their duties.

They are not allowed to perform the functions of a layer-out of corpses.

The apparatus which each candidate receives, together with the certificate of examination, must be kept in repair and always ready for use.

Midwives are not allowed to take any medicinal steps without the authority of an authorised physician, nor to give medical advice, or write medical prescriptions, except as regards the use of the catheter, enema, and the medicines used in connection with it, *i.e.*, spirit of hartshorn, liquor Hofmann, and tincture of cinnamon.

A midwife may not leave a case of confinement, where she has been called in, until it be completely finished; not even if she be called in to attend another confinement. In such an eventuality she must, without delay, refer such person to a second midwife or to an authorised doctor.

In cases of abnormal, difficult, or in any way anxious confinement, the midwife is bound to ask in good time that an authorised doctor be called in.

Should the mother or her relations object to this the midwife must take care, by repeating this request before witnesses, that she be able, if necessary, to prove that she did so.

A midwife must, after attending a case which is accompanied by puerperal fever, before going to another confinement, observe the strictest cleanliness, and must, especially before making any examination, carefully wash her hands in a 30 per cent. solution of carbolic acid.

Midwives are bound always to follow the advice of an authorised physician.

A midwife is bound to report immediately to the police any case which may come within her knowledge of concealment of pregnancy or confinement, attempts at abortion, change of children at birth, or infanticide.

A midwife must make a monthly report to the local physician, under whose authority she is placed, showing the number of confinements which she has attended.

All the midwives of a district or parish must come yearly before the local doctor, who will examine them in the subjects which formed the course of instruction. The apparatus will also be examined.

(Enclosure III.)

REPLIES to certain Questions in the Enclosure in Lord *Salisbury's* Circular Despatch of 18th May 1892.

Stillbirths.

Question No. 6.—In the year 1890 the number of stillborn children in Bavaria was 6,436; the average for five years in the period 1876—1890 was 7,045.

Question No. 9.—The Imperial Law of the 6th of February 1875 decides this. The deposition of the midwife is accepted by the registering authorities, should the legitimate father be personally prevented from doing this.

Question 10.—There is no special statistical information as to the bulk of the midwifery practice being in their hands; it may, however, be assumed for certain that this is so, from the fact that the number of midwives actually practising in Bavaria is 4,658. The average number of attendances was one midwife to 43 births of the total births in Bavaria.

Question 12.—This can only be answered in so far as it refers to cases of death resulting from the act of confinement or in consequence of childbed.

For the year 1890 the anomalies attendant on the state of pregnancy, travail, and confinement (miscarriage, hemorrhage, and eclampsy), resulted in 567 deaths, which is 2·84 per 1,000 confinements.

Four hundred and fifty-nine died of puerperal fever, which is 2·30 per 1,000, the average per annum from 1876 to 1888 being 2·56 per 1,000 confinements.

In the year 1889 there were 9,311 cases of childbed in which surgical operations were applied under which or subsequently 426 mothers succumbed, which is 45·8 per 1,000.

SAXE-COBURG AND GOTHA.

COPY Despatch from Her Majesty's Chargé d'Affaires at Coburg.

(No. 26.)

My Lord, Coburg, 5 July 1892.

WITH reference to your Lordship's Circular Despatch of the 18th May, instructing me to obtain the information specified therein regarding stillbirths, in so far as relates to the Duchies of Coburg and Gotha, I have the honour, after communicating on the subject with the Minister of State, to report as follows :—

With regard to the information required in questions 1, 2, 3, 5, 7, 8, and 9, there are no special regulations in these Duchies other than those contained in the Imperial German laws passed at Berlin for the whole Empire, and which will therefore be included in the Report which your Lordship will receive from Her Majesty's Embassy at Berlin.

As regards the remaining points, I have been favoured with the following information by the Ducal Ministry :—

4. A special legal definition of a stillborn child does not exist in this country.

6. The number of stillborn children in the Duchies of Coburg and Gotha in the year 1890 amounted to 231 (115 male and 116 female).

10 and 11. According to the regulations in force in these Duchies, midwives are only allowed to practise after having obtained the necessary permission from the authorities of the district in which they establish themselves.

Such permission can only be granted to women who have received instruction and passed the required examination in one of the public schools of midwifery of the German Empire.

The parish authorities in the Duchies of Coburg and Gotha are required to provide for the necessary number of midwives in their respective parishes.

12. There are no statistics as to the number of women who die in their confinements or during the four weeks immediately following.

I have, &c.

The Marquess of Salisbury, K.G. (signed) *Ralph Milbankey.*

HESSE.

INFORMATION regarding Stillbirths and Midwifery in the Grand Duchy of Hesse.

1. The registration of stillbirths is determined for the whole German Empire by Section 23 of the Imperial Law on the civil condition of the population, and also by the Marriage Law of 6th February 1875.

2. The registration is carried out, according to the above law, exclusively by the authorities who undertake the registration of births, deaths, and marriages.

3. Stillbirths are *only* registered as deaths.

4. The Imperial Law makes no difference between children stillborn and those who have died at birth.

A more accurate definition of the difference between these is not to be found in the law.

There appears to be, however, no doubt that a child which has not died in the womb, but has lived, even for a very short period after its separation from the mother, cannot be regarded as stillborn, but must be registered in the list of both births and deaths.

As regards the registration of untimely births, the laws that govern these throughout Germany vary considerably in the different states. In some the 180th day after conception, in some the end of the sixth calendar month, or the 28th week of pregnancy, are considered as decisive. In the Grand Duchy of Hesse the registrars are instructed that, according to the Imperial Law, no difference is made with regard to a stillborn child and one who has died at birth, with reference to the capacity for life which each may

GERMANY—HESSE—*continued.*

Answer 4, *continued.*

may have possessed. Hence it is their duty to register all stillbirths in human form (to the exclusion of real abortions, which are not registered), without regard to their capacity for life, as deaths.

5. The penalty imposed for neglecting to register a stillbirth is 150 marks (7*l.* 10*s.*), or the corresponding term of imprisonment. This penalty is, nevertheless, not enforced against the informer whose duty it was to give the information, provided it has been given within the required period.

In addition to this, the registrar is authorised to impose a fine upon the neglectful informer of not exceeding 15 marks (15*s.*) for each offence.

A registrar who neglects to register a stillbirth renders himself liable to a caution, a reprimand, or a fine—disciplinary punishments, to be administered by the Board of Inspectors; the fine, however, is not to exceed 100 marks (5*l.*) for every offence.

6. In the Grand Duchy of Hesse, during the year 1890, there were stillborn 1,159 children out of a total of 31,159 births, or 3·72 per cent.

7. The Penal Code for the German Empire determines as follows:

A mother who, during or immediately after its birth, kills her illegitimate child, is liable to penal servitude for not less than three years. Should extenuating circumstances be pleaded and proved, the penalty will be two years' simple imprisonment. Should a woman with child purposely destroy the fruit of her womb, or kill it in the womb, she is liable to a punishment of five years' penal servitude. In case of extenuating circumstances, to six months' imprisonment. The same penalty awaits him who, with the knowledge of the mother, procures the abortion or death, or furnishes her with the means of carrying them out.

Anyone who commits the aforesaid action for remuneration is liable to 10 years' penal servitude.

Any person procuring an abortion or the death of the fruit of the womb, unknown to the mother, is liable to 10 years' penal servitude, and should the death of the woman ensue upon such operation, the penalty may be extended to 10 years, or even for life.

8. The Order of the Council of the Confederation, dated 22nd June 1875, now for the German Empire, gives the form of certificate in registering stillbirths. In these cases the part referring to a death is crossed out in the ordinary register, and the stillbirth substituted in the margin, according to the following scheme:—

Berlin, 6 January 1876. Before the U.S. Public Officer appeared this day in person known the midwife, Widow Ida Friedmann, born Janke, living at Berlin, in the Street No. 17, and declared that	
old, religion, living at born at in died on the One thousand eight hundred and at o'clock	a child of the female sex was born to Louise Naumann, of Evangelical religion, in the house of her husband, the Hatter Robert Naumann, Evangelical religion, at Berlin, in Street, No. 67, on the fifth day of January of the present year, at 3 p.m., and that the said child died at birth.
Read over, approved, and undersigned, N.N. The Official Registrar, N.N.	The Widow Friedmann further declared that she was present at the confinement of Mrs. Louise Naumann. Read over, approved, and signed, *Ida Friedmann*, The Official Registrar, N.N.

Should a child not have "died at birth" but have been stillborn, then the words, "and that the said child was stillborn" are to be substituted for the words "and that the said child died at birth."

Answer 8, *continued.*

The registering officers are specially instructed to be most careful in these cases to ascertain as far as possible the accuracy of the statement made to them by the person giving the Declaration, and entering in their register whether the child was stillborn or died at birth.

9. The midwife who was present at the birth can only give the information to the registrar verbally.

In the case of births which occur in public institutions, such as lying-in hospitals, prisons, barracks, and similar places, the requisite information is to be given by the head or director of such institution in an official form, and in writing, this officer being exclusively authorised to make such declaration.

10. According to the Medical Regulations for the Grand Duchy of Hesse, every medical district is divided into a corresponding number of midwifery sub-districts, each of which is furnished with a thoroughly reliable and well-proved head midwife (parish midwife). These persons are chosen out of the parish population by the medical director of the district, the clergyman of the parish, and the mayor. They must have reached the age of 20, and not passed that of 30 years. They receive their education at the expense of the parish in one of the Government lying-in hospitals at Giessen or Mayence. Besides these, private midwives are allowed to practise; that is, those whose education has been at their own expense, and who have likewise obtained the necessary certificates of proficiency at one of the Government institutions. The number of midwives in Hesse was, on the 1st April 1887, 1,232, or one midwife to 800 of the population.

It may be assumed that 95 per cent. of all the births in the Grand Duchy take place in the presence or with the assistance of a midwife, and 5 per cent., at the most, under the exclusive direction of a physician.

11. A course of six months' instruction is prescribed for the situation of a midwife. This course is to be followed in one of the Government institutions, and costs 200 or 300 marks, 10*l.* or 15*l.* for each pupil, according as she is entered at Giessen or at Mayence.

Should the pupil pass the requisite examination, she receives a certificate of her capability, in virtue of which she receives the necessary instruction under the regulations which were framed in 1888 on the antiseptic treatment of births, and is finally told off for her duties by the medical inspector of the district.

All midwives are placed under the authority of the medical inspector, from whom they receive their special instructions and advice, and in case of neglect of their duties, reprimand, and finally disciplinary punishment inflicted by the Medical Board, which can prosecute them before the law courts, and deprive them of their certificates.

The medical inspectors are recommended to examine the midwives from time to time, in order to ascertain any diminution in their proficiency.

In consequence of a recent regulation there have been established in the two State institutions of Giessen and Mayence annual extra courses of study for the parish midwives, which can also be attended by private midwives, and it is arranged that every midwife shall be obliged to attend one of these courses every five years.

The course in question is supposed to last eight days, except in the case of such midwives who are considered specially deficient in their knowledge, when it may extend to double the time.

In these courses, where instruction and board and lodging are provided free of expense, the cost of the journeys of the pupils alone falling to the parish rates, the most important sections of midwifery, as treated in the newest publications on the subject, are shortly, but thoroughly taught and recapitulated, and newly discovered modes of treatment or of manipulation are shown and thoroughly practised, while the most recent disinfecting modes of operation receive special attention.

The certificates of midwives can be withdrawn from them should they at any period prove themselves devoid of those qualities for the possession of which they were originally bestowed upon them.

12. In the Grand Duchy of Hesse, between the years 1877 and 1890, on the occasion of 444,253 births, 2,427 women died in their confinement, *i.e.*, 5·5 per 1,000. Of these it is supposed that 1,370 died of puerperal fever, and 1,057 of other complaints connected with childbirth.

These figures include also such cases as terminated fatally beyond the period of four weeks and those deaths which followed abortion.

In order to maintain more accurately the statistics regarding the deaths by puerperal fever, a regulation was framed on 14th May 1890, by which every medical inspector and physician is held to enter such cases in a special register, according to the accompanying form, and which will form a convenient basis for subsequent statistical returns.

BADEN.

REPLIES to Questions respecting Stillbirths and Midwifery in the Grand Duchy of *Baden.*

ARTICLES 1 and 2.

ACCORDING to paragraph 1 of the Imperial Law of 6th February 1875, concerning the official registration of Civil Status and Marriage (from the "Imperial Law Gazette" of 1875, No. 4, pp. 23ff), the official registration of births, marriages, and deaths is exclusively made by officials appointed by the State by entries in the register appointed for that purpose (register of births, of marriages, and of deaths). Every birth of a child, even when born dead, or dead in the moment of birth, must be notified to the civil official (Standesbeamte) of the district in which the birth has taken place (Sections 17 and 23 of the aforesaid law). The notification must be made verbally by those persons named in the law (paragraph 18) themselves or by some other person who knows the fact of his own knowledge.

3. In a case of stillbirth, or of a child dead in the moment of birth, the entry need only be made in the register of deaths (paragraph 23).

4. The definition of a stillborn child is not contained in the above-mentioned Imperial Law nor in any other law.

5. Anyone failing to fulfil the duties of notification prescribed by the law is punishable by fine up to 150 marks, or by imprisonment. Such imprisonment shall not be inflicted in cases where the notification, although not made by those directly obliged to do so, has nevertheless been made in accordance with the law.

Furthermore, the civil officials are empowered to compel the persons concerned to make notifications by money fine, which must not exceed 15 marks in each particular case (paragraph 68 of the law).

Furthermore, the following penal clauses of the Imperial Criminal Code are here applicable :—

"Paragraph 271. Any person knowingly procuring that declarations, actions, or facts which have any validity before the law, or in legal matters, shall be officially registered as accomplished or done in public documents, books, or registers, when as a matter of fact they have not been accomplished or done, or have been done so in a different manner, or by some one not entitled to perform the act, or by a totally different person, shall be punished by imprisonment of not more than six months, or by a fine of not exceeding 300 marks.

"Paragraph 348. Any official who being empowered to register public notifications falsely registers a fact recognisable by law, in the exercise of his functions, or makes a false entry in a public register or book is punished with imprisonment of not less than one month. Any official who knowingly makes away with, destroys, injures, or falsifies any official notification which has been duly entrusted to him, or to which he has access, is similarly punishable.

"Paragraph 349. If any of the actions indicated above under paragraph 348 have been performed with a view to procure material advantage to another person, or to do injury to another, the punishment therefor shall be one of not exceeding 10 years in the penitentiary, and a simultaneous fine of from 150 marks to 3,000 marks."

6. In 1890 there were 1,446 stillborn children entered on the death register of the Grand Duchy, *i.e.*, 2·72 per cent. of the total births.

7. Paragraph 218 of the Imperial Criminal Code runs as follows :

"A pregnant woman who knowingly destroys the fruit of her body or kills it within the matrix, is punished by imprisonment not exceeding five years in the penitentiary.

"If there should be extenuating circumstances, the imprisonment may be reduced to an amount of not less than six months.

"These penal regulations are applicable to such persons as apply or furnish the means of such destruction or killing (of the fœtus) with the consent of the pregnant person.

"Paragraph 219. Any person who has for a money reward procured the means or applied them, or furnished them, to a pregnant woman who shall have destroyed or killed her fœtus is punished with imprisonment in the penitentiary not exceeding 10 years.

Answer No. 7, *continued.*

"Paragraph 220. Any person who knowingly destroys or kills the fœtus of a pregnant woman, without her knowledge or consent, is punishable with imprisonment in the penitentiary of not less than two years.

"If the death of a pregnant woman is caused by her treatment, then such treatment is punishable by imprisonment in the penitentiary of not less than 10 years, and as a maximum for life."

8. The notification of every birth, including stillbirths, must be made *verbally* before the civil official, according to Paragraph 19 of the Law. No further formality is necessary.

In general a notification in *writing* is not sufficient; only in cases of births taking place in public institutions for confinements or for midwives, hospitals, prisons, barracks, and other similar institutions is a written notification sufficient on the part of the director of the institution, or of the competent official, as an actual notification in official shape (paragraph 20).

9. In cases where the legitimate father is hindered from so doing, or where there is none, the midwife present at the birth is obliged to give notice of such birth to the civil official (paragraph 18).

10 and 11. In accordance with paragraph 30 of the German industrial code, women desiring to carry on the business of a midwife within the limits of the German empire require a certificate of competency issued by the authorities recognised by local law.

In the Grand Duchy of Baden such women are recognised for the practice of the business of midwife as have obtained a certificate of possessing the necessary technical knowledge and skill, granted by the director of a public school of midwifery after having passed a course in such school;—there are three such schools in the Grand Duchy.

Attestations of the necessary physical qualities for the profession, and of an irreproachable character, are requisite for admittance into these schools. In accordance with paragraph 134 of the police code, midwives are obliged to comply with the provisions in the official regulations for midwives during the exercise of their business.

The district councillor has the right of decision respecting the withdrawal of the certificate of a midwife practising in the district in which he resides or officiates.

In order to insure the presence of the necessary help at births among the population, an order was issued on 10th November 1885, that in each commune there must be a number of midwives corresponding to the local needs. As a rule one midwife in communes of 1,000 inhabitants may be taken as an average. If the number of midwives recognised as locally necessary is not present, the communal authorities must exert themselves to procure such. The same authorities must in case of necessity pay for the education, at the cost of the commune, of women corresponding to the number required for this purpose in one of the public midwifery schools, must provide them with the necessary apparatus and drugs, and must give them a proper salary.

The appointments, however, of the so-called communal midwives does not give them any exclusive claim to exercising such functions within the communal district.

On the contrary the practice of other midwives is fully permitted, provided that they possess the necessary certificate.

The number of midwives in existence was classified as follows :—

	Communal Midwives.	Other Midwives.
In 1887 - -	1,841	287
1888 - -	1,821	285
1889	1,821	282
1890 - -	1,795	289

GERMANY—BADEN—*continued*.

12. As regards mortality in consequence of confinements, statistics show the following results :—

YEAR.	Births.	Deaths in first Three Weeks.	Proportion per Thousand.
1884	54,625	421	7·7
1885	53,465	449	8·3
1886	54,236	423	7·7
1887	53,750	368	6·8
1888	53,146	398	7·4
1889	53,771	360	6·6
1890	52,443	358	6·8

The cases of puerperal fever and deaths therefrom in the last seven years were as follows :—

YEARS.	Births.	Deaths.	Deaths per Thousand.	Illnesses per Thousand.
1884	425	237	4·3	55
1885	476	252	4·7	53
1886	545	218	4·0	39
1887	476	188	3·3	38
1888	555	201	3·8	37
1889	462	173	3·2	39
1890	363	134	2·5	36

SAXONY.

COPY of Despatch from Her Majesty's Representative at Dresden.

No. 41.

Dresden, 29 December 1892.

My Lord,

REPLYING to the Circular of 18th May, I have the honour to state, that Questions 1—3, 5, 7—9, of the House of Commons memorandum refers to points ruled by Imperial law, and not by separate Saxon enactment.

Question 4. There is no legal definition of stillbirth.

According to Saxon practice, there is no registry for births occurring less than six months after conception.

Question 6. The statistics for 1890 were :—

Births - - - - - - - - - - - 140,514

Stillbirths - - - - - - - - - - - 5,147

the mean population of the kingdom being 3,473,975 persons.

Question 10. Midwifery practice is only permitted to persons officially licensed.

Question 11. The subject of midwifery has been regulated from time to time by Royal Mandates and Administrative Orders, which embrace the entire field of the education, registration, and admission to practise, of women following the obstetric profession, and define in detail their duties and responsibilities, as well as the medical and surgical procedure which they are to observe.

GERMANY—SAXONY—*continued.*

Question 11, *continued.*

Relevant to the present inquiry are the revised rules issued in the present year, of which the essentials are herewith given :

Intending practitioners must follow a six months' course of instruction at one of the public midwifery schools (Dresden and Leipsic). Candidates must possess an elementary general education; be provided with a guaranteed medical certificate of physical fitness; and with official testimonials to personal character and reputation.

The eventual admission to practise of women qualified as above, is under the warrant of the official district medical officer, who has to take care that the midwife is in possession of the various regulations, as well as of the substances and appliances required.

Before commencing practice, the midwife makes oath that she will conscientiously follow all the rules laid down by authority for the prevention of puerperal fever and inflammation of the eyes in new-born infants, truly observe the official regulations for midwives, and faithfully discharge all the duties of her profession.

The oath implies, in particular, acceptance of the official scale of fees, liability in case of neglect to fines ranging to 7*l.* 10*s.*, or imprisonment, or alternative prosecution; and submission to medical control as regards fitness. A midwife must further strictly respect the privacy and secrecy of the families or persons by whom she is employed; must make report to the competent local authority of any attempts to procure abortion, and, according to circumstances, notify to the local registrar any births at which she has been present.

The printed instructions contain minute rules for the prevention and treatment of fever and inflammation of the eyes, and define the instrumental and pharmaceutical appliances required in cases of parturition. They impose the precautions to be observed in regard to cleanliness and disinfection, and regulate a variety of miscellaneous obstetrical details.

Question 12.—The separate Saxon statistics of the mortality amongst lying-in women, within the four-week period, are as follows :—

	Total Number of Deaths within Four Weeks.	Proportionately to 10,000 Births, same Period.
1883	849	64·2
1884	990	72·0
1885	960	69·6
1886	902	63·6
1887	801	56·9
1888	852	58·5
1889	870	58·8
1890	760	52·2

Hence the deaths in childbed, for the kingdom, average from ·50 to ·70 per cent. of all lying-in women.

I have, &c.

The Right Honourable Earl of Rosebery, K.G., &c. &. &c.

(signed) *G. Strachey.*

AUSTRIA-HUNGARY.

AUSTRIA.

Answers to Questions respecting Stillbirths, &c., in Austria.

(1.) The registration of stillbirths in the "Registry of Births and Deaths" is compulsory.

The duty of the registrars is to register every single birth and death which takes place in their respective districts, and their special attention was drawn to the necessity of carefully noting every case of stillbirth by a Decree of the Imperial Ministry of the Interior, dated 1st April 1870.

(2.) The registration of stillbirths is carried out by the same officials who register ordinary births and deaths.

(3.) Stillbirths are registered both as births and as deaths.

(4.) The laws of Austria do not contain any definition as to the exact nature of a stillborn child.

The above-mentioned Decree, however, of 1st April 1870, stated that "such children should be considered 'stillborn' as had reached that stage of development which would have enabled them to live, but who were born actually dead, and not such as died immediately after birth."

(5.) The penalties for neglecting to register a stillbirth are ordained by the Ministerial Decree of 30th September 1857, whereby such offences are punishable either by a fine amounting to from 1*s.* 8*d.* to 8*l.* sterling, or with imprisonment for from six hours up to a fortnight.

(6.) The number of stillbirths occurring in 1890, according to health statistics furnished by the provincial authorities was, in

Lower Austria	4,032	The Vorarlberg	39
Upper Austria	898	Bohemia	6,883
Salzburg	162	Moravia	1,972
Styria	1,616	Silesia	640
Carinthia	343	Galicia	7,569
Carniola	286	Bukowina	533
Triest and district	341	Dalmatia	137
Görz-Gradiska	143		
Istria	206	Total	26,315
The Tyrol	516		

(7.) The penalty for the crime of procuring abortion is (according to Section 148 of the Austrian Criminal Law of 1852) penal servitude for a period of from one to five years; and in case the life or the health of the mother are endangered thereby, of from five to 10 years.

(8.) There is no special regulation dealing with the registration of stillbirths, nor has any special form of certificate for the same been issued in Austria.

(9.) It is the duty of every midwife to arrange that the district coroner [Todtenbeschauer—Inspector of dead bodies] should view, as the law orders, the remains of every child that is stillborn, irrespective of the stage of corporal development which it may have reached. [*See* Section 13 of the Ministerial Decree (with Instructions to Midwives) of 4th June 1881, of which a translation is shown below.]

The registration takes place upon the production of such coroner's certificate, which, as in the case of a death of any description, is drawn up by the official coroner attached to every district.

(10.) Midwives are recognised by the State in Austria, as forming part of the Department of Public Health, and their duty, in the case of normal births, is to practise their calling independently of other assistance.

Answer 10, *continued.*

In the case, however, of complications arising, either during or after the birth, and, in general, when anything abnormal occurs in connection therewith, the midwife is bound to insist upon a physician being called in. And the midwife is absolutely forbidden to perform any operation upon the person of the woman whose confinement she is attending.

The right to practise the calling of a midwife is obtained by passing a strict examination, for which the candidate may present herself at the end of a six months' course of theoretical and practical instruction at one of the State schools of midwifery.

(11.) In the practise of her calling, the midwife is bound by the latest "Instructions to Midwives" which happen to be in force for the time being, and which are, at present in 1892, those issued by the Ministerial Decree of the 4th June 1881, of which the following is a translation:

DECREE of 4th June 1881, by the Austrian Minister for the Interior, issuing revised Instructions for Midwives.

"Women who have obtained the authorisation to practise midwifery in Austria, and who are desirous of following their calling there, have to observe the following Instructions, which shall serve also as guidance for official physicians and other authorities concerned:—

"Section 1.—Midwives are subordinate to the political Authorities of First Instance (Magistrates, Burgomasters, &c.), and to official physicians.

"Section 2.—Midwives have to inform these local authorities of the district where they propose to follow their calling, and have to present themselves before the official physician and show him the instruments, &c., mentioned hereafter in Section 3.

"Section 3.—[This section gives a detailed list of instruments and drugs which the midwife is ordered always to have at hand in proper order.] The official physician has to convince himself from time to time that the midwives in his district are in possession of these instruments and drugs, and that they are in proper condition.

"Besides, the midwife must be in possession of a good book of technical instruction in midwifery, and in any case that which served as her text-book during her course at the midwifery school.

"Section 4.—Midwives are held to conduct themselves in a seemly fashion, and to be ready at any time of the day or night to go to the assistance of any woman who may call them in, irrespective of class.

"Section 5.—Midwives must be strictly cleanly in their persons and as regards their clothing and instruments, with special respect to the danger of puerperal fever. They must always have at hand some means for disinfecting their hands and instruments.

"Section 6.—A midwife must remain with a woman in childbirth during the whole course of the birth, and for three hours, at least, after it.

"In case of an abnormal case, or of any irregularity, the midwife is bound to insist upon calling in a physician, and to strictly carry out his instructions.

"Except in cases of absolute necessity, where it is impossible to find the services of a second midwife, no midwife shall attend two cases of childbirth at the same time, going from one to the other, for, when this becomes necessary, a grave risk of danger to one or to both patients is incurred.

"Section 7.—In any cases of abnormal birth, or of illness or sudden death of either the mother or child, the midwife shall at once call in a physician.

"Section 8.—Only physicians or their assistants are permitted to undertake any necessary operation, or to give prescriptions, and midwives are absolutely forbidden to attempt the same, except in extreme cases.

"Section 9.—In the case of children who are apparently dead, but of full development, and on whom no sign of decomposition is evident, the midwife is compelled to call in a physician, and in his presence to carry out the prescribed methods for resuscitating persons who are apparently dead, and such efforts must be continued in any case for at least half an-hour.

"Section 10.—It is the duty of a midwife to see that the birth of every child, the delivery of whose mother she may attend, is registered in the Registry of Births at the right time.

"Section 11.—A midwife may perform the baptismal ceremony for a dying child, or for one in which the existence of life is doubtful, and such a baptism has to be brought to the notice of the respective parson.

"Section 12

Answer 11, *continued.*

"Section 12.—The midwife must be present at the ceremony of baptism of every child, and must furnish, if called on, details of the date, &c., of birth and the mother's name.

"Section 13.—It is the duty of the midwife to arrange that the coroner [Todtenbeschauer: Inspector of Dead Bodies] should view the body of every child that is born dead, without reference to the amount of corporal development which has been reached.

"Section 14.—If a midwife is called in to examine a woman who is suspected of pregnancy, she must indicate the necessary measures to be taken, or remain, if necessary, and assist at her delivery.

"Section 15.—A midwife is bound, without any exception, to give notice at once to the police of any knowledge or suspicion that she may have of child-murder, abortion, or similar criminal proceedings.

"Section 16.—Any midwife who herself takes any part in such a crime, or who fails to give the above-mentioned notice to the police, renders herself liable to criminal prosecution.

"Section 17.—Midwives must scrupulously respect the secrets confided to them by women in childbirth, excepting when called upon to give evidence by the Legal Authorities.

"Section 18.—Such evidence must be given according to the best ability of the midwife.

"Section 19.—Every midwife must fill up, punctually and faithfully, the Tables of Births, which are furnished to her by the Authorities, and must deliver them at set times to the official doctor, who has to use them for statistical or scientific purposes.

"The midwife is, therefore, recommended to provide herself with a Note-Book, for the purpose of writing down the details on the spot.

"Section 20.—Every midwife must follow exactly the instructions which they may receive along with their diploma, or from the Civil Authorities, and to guard especially against carrying any infection or causing puerperal fever.

"Section 21.—The foregoing instructions shall take the place of those formerly issued on 25th March 1874 and on 23rd October 1878.

(signed) *Taafe.*"

(12.) Statistics from which it would be possible to give the total number of women, per thousand, who die in their confinements, or thereafter, do not at present exist in Austria. However, from the weekly health-returns furnished by the Authorities of certain large cities and districts, the following numbers have been taken as indicating the total number of women who died during their confinements in the places named, in the year 1891, in :—

Vienna	120	Pilsen	8
Neustadt	1	Reichenberg	5
Linz	4	Leiplitz	4
Steyr	2	Wernsdorf	1
Salzburg	—	Brünn	5
Graz	18	Olnürtz	5
Marburg	1	Iglau	1
Klagenfurt	5	Ostrau	2
Laibach	6	Prossnitz	3
Triest	19	Sternberg	2
Görz	1	Znaim	1
Pola	3	Troppau	2
Innsbruck	1	Teschen	—
Grent	—	Lemberg	8
Prague	60	Krakau	20
Karolinenthal	—	Brody	—
Smichow	7	Drohobyez	4
Weinbergen	3	Jaroslav	7
Zirkow	5	Kolomea	5
Asch	3	Przemysl	5
Aussig	5	Sambor	5
Brüx	2	Stanislau	2
Budweis	3	Tarnopol	2
Eger	6	Tarnow	1
Gablenz	1	Czernowitz	4
Kladno	2	Zara	1
		Total Number of Deaths of Women in their Confinements in these places	381

HUNGARY.

COPY Despatch from Her Majesty's Consul General for Hungary.

Sir, Budapest, 5 November 1892.

WITH reference to the Circular requesting information with regard to the registration of stillbirths, which Her Majesty's Embassy forwarded to me on the 22nd ultimo, I beg leave to supply such information as I have been able to obtain on the subject. I will reply to the questions *seriatim.*

1. The compulsory registration of all births and deaths falls in Hungary solely within the competency of the Church Authorities of the several religious confessions. Civil registry, either of births, deaths, or marriages, does not exist in this country. No special mention is made in any Laws or Regulations of the registration of stillbirths.

2. The registration of stillbirths would be carried out by the same Church Authorities who register ordinary births and deaths.

3. So far as I have been able to ascertain from the several Ecclesiastical Authorities, it is their custom to register stillbirths as deaths.

4. There is no legal definition of a stillborn child.

5. Stillbirths are, as above stated, regarded as deaths. Deaths are only registered on a certificate from a medical officer specially appointed by the Authorities in each parish. This officer is termed "Inspector of Deaths." No individual is allowed to be interred or his death registered till such certificate has been handed to the competent Church Authorities. Those who transgress the regulations on the above point are liable to a fine up to 50 florins (4*l.* 3*s.* 4*d.*).

6. The number of stillborn children interred and registered in Hungary in 1890 was 13,193.

7. A mother, who is enceinte of an illegitimate child, who intentionally causes a miscarriage, or who destroys the child in the womb, or who causes the same to be done by others, is punished with imprisonment up to two years. A mother who is legally married is punished with imprisonment up to three years for the same offences. Similar punishments are inflicted on other parties who, with the consent of the mother, commit similar crimes. And if such parties perform such acts for purposes of gain, the punishment may be increased to five years' imprisonment.

Any party who, without the consent of the mother, causes such miscarriage or destroys the child in the womb, shall be punished with penal servitude up to five years. In this latter case, if the death of the mother is caused by such acts, the punishment will be from 10 to 15 years' penal servitude.

8. The forms of Death Certificates, and of the certificate of the Death Inspector, are as follows :

(Enclosure No. 1.)

DEATH CERTIFICATE.

Year, Month, and Day of Death.	Name, Rank, and Profession of the Deceased, or of the Consort or Parents of the Deceased.	Place of Birth, Residence, and Number of the House of the Deceased.	Sex of Deceased		Age of Deceased.	Cause of Death.	Place and Date of Burial.	(For Catholics only.) Whether last Sacraments were administered.	Name and Official Position of the Burial Officer.	REMARKS.
			Male.	Female.						

AUSTRIA-HUNGARY—HUNGARY—*continued.*

Answer 8, *continued.*

(Enclosure No. 2.)

CERTIFICATE OF DEATH INSPECTOR.

Sorszám.	Halothvizsgálati bizonyitvány.	
1.	Name and surname of deceased, and family status.	
2.	Rank and profession of deceased	
3.	Domicile - - - - -	
4.	Place of birth - - - -	
5.	Age - - - - - -	
6.	Religion - - - - -	
7.	Cause of death - - -	
8.	Nature of disease - - -	
9.	Name of doctor who attended deceased.	
10.	Day and hour of death - -	
11.	Date on which deceased is to be buried.	
12.	Remarks - - - - -	
	Date	Death Inspector.

9. No certificate from a midwife would be held sufficient, but only a certificate, as above mentioned, from the Inspector of Deaths.

10 and 11. By a law of 1876, no midwife who is living within 75 kilometres of a medical university or of a State midwifery school, is allowed to practise without having received a diploma. Those midwives who live outside such radius must obtain permission to practise from the chief medical officer of the locality. The bulk of the midwifery practise is, I am informed, in the hands of properly certificated midwives.

12. I am told that it is not possible to give data of any trustworthy character as to the rate per 1,000 of women who die in their confinements or four weeks immediately following.

I have, &c.
(signed) *A. Nicolson.*

The Honourable W. G. C. Barrington.

I T A L Y.

REPLIES to Questions respecting Stillbirths and Midwifery in Italy.

1. The registration of stillbirths is compulsory.
Act 56 of the Ordinance of the Civil State, 1865, runs as follows :—
"If the infant is not living at the moment of the declaration of birth, the officer shall restrict himself to noting the circumstance in the 'Acte de naissance,' inserting the words 'che non vive.'"

2. The registration is effected by the ordinary registrar of births.

3. Stillbirths are registered as births only; there being only this difference between the registration of the birth of a living child and that of a stillbirth, that in the entry of the latter the words are added, "the child is not alive."

4. The law regards as stillborn not only children issuing dead from the mother's womb, but also children born with no power of life (non-vitali).

5. Neglect to register a stillbirth is punished with a fine ranging from 10 to 200 lire.

6. Stillbirths in Italy amounted in 1890 to 42,117.

7. The penalties for criminally causing a child to be stillborn vary. The following is a summary of the law on this point :—

Any woman procuring, or consenting to the procuring of, abortion is liable to from one to four years' imprisonment.

Anyone procuring an abortion for a woman with her consent is liable to from 2½ to 5 years' hard labour ; should the woman die, this penalty is extended to from 4 to years' hard labour, and should death be the result of the adoption of means more dangerous than those to which the woman had given her consent, the penalty is further extended to from 5 to 10 years' hard labour.

Anyone using means to procure abortion without the woman's consent is liable to from 2½ to 6 years' hard labour, and to from 7 to 10 years' hard labour should the abortion take place; the penalty is increased to from 15 to 20 years should death result, and it is still further increased by one-sixth in each case should the offender be the husband.

The terms of imprisonment in the several cases are extended by a sixth should the offender be a doctor, or a member of a profession placed under Government control, and shortened by from one to two-thirds of the whole term should the woman's object in committing the offence be the saving of her own honour, or should the offence be committed by anyone in order to save the honour of a near relative.

8. The following is a translation of the entry of the birth of a stillborn child :—

COMMUNE OF ROME.

Office IV. of Statistics and Registration.

Extract from the Register of Births, of the year 18 . No.

Series A., Volume 1, Part I.

The Syndic of the Commune of

Province of

On the 4th day of June 1892, at 8 hrs. 10 min. p.m., at the offices of the Commune, James Alberelli, aged 30, tradesman, residing in this city, appeared before me, Anastasio Cocchi, barrister-at-law, deputed by the Syndic on the 15th September 1875, by a deed duly confirmed, to be a registering officer of the Commune of Rome ; and made declaration to me that at 6 hrs. 40 min. p.m., on the third day of the current month, in the house No. 56, of street, Catherine Lucarelli, sempstress, his wife, living with him, gave birth to a child of the male sex, which was not produced before me, and which he names Joseph Adrian, and which is dead. There were present, as witnesses to the above-mentioned declaration, and to the present document, Francis Cinerari, aged 48, and John Lucarelli, 24, both residents of this Commune. The child was ascertained to be dead by the Municipal Inspector of the Dead. This document was read over to the persons present and signed by them and myself.

(signed) *Jas. Alberelli.*
Francis Cinerari.
John Lucarelli.

Signature of the Registering Officer, *A. Cocchi.*

This, an exact copy of the original, is forwarded to Mr. in pursuance of Art. 379 of the Civil Code.

Rome, the first August 1892.

The Officer in Charge,
The Registering Officer,

9. As in the case of the registration of other births, so also in the case of that of stillbirths, no certificates signed by the midwives, unless they appear in person before the officer of the Civil State, are accepted ; the father or mother, or midwife, or someone present at the birth, must appear personally before him, and if the baby is not actually produced before him a medical officer is sent to verify the birth.

ITALY—*continued.*

10-11. Women proposing to practise the profession of midwife in Italy must pass an examination in the obstetric science, and obtain a proper diploma at one of the universities or institutes authorised to give them.

It has been found that were this rule rigidly enforced the smaller communes would be deprived of the services of midwives, their poverty preventing them from employing properly-authorised women, and, therefore, it has of late been the custom, sanctioned by Royal Decree, to regularise the position of women acting as midwives in such small communes without the possession of a proper diploma, by giving them a certificate of permission to practise, if they have practised without the sanction of the law satisfactorily during a term of five years.

The Prefect is charged with the distribution of these certificates.

12. The approximate proportion of women dying within four weeks of delivery is in Italy 5·4 per 1,000.

RUSSIA.

COPY Despatch from Her Majesty's Chargé d'Affaires at St. Petersburg.

My Lord, St. Petersburg, 5 July 1892.

WITH reference to your Lordship's Circular Despatch of 18th May last, instructing me to obtain information respecting stillbirths in Russia, as specified in the enclosure of the above-mentioned Despatch, I have the honour to inform your Lordship that, from information which I have received from the head of the Imperial Medical Department, no answer can be given to Questions 1, 2, 3, 4, 5, 6, 8, and 9, for the reason that no legal registration of stillbirths exists in Russia.

With regard to Question 7, persons who have criminally caused a child to be stillborn, or to be delivered prematurely, are condemned to penal servitude with hard labour for four to six years, and if the abortion has been brought about with the consent of the mother she is condemned to exile in Siberia.

In answer to Question 10, midwives are recognised by the State. In towns the midwifery practice is exclusively in their hands; in rural districts it is far from being so extensive, owing to their functions being there often performed by women who have had no professional training.

In the case of Question 11, midwives are allowed to practise on passing the requisite examination at the Medical Academy at St. Petersburg, or at any of the universities of the Empire, under special rules and regulations laid down for their guidance in the Medical Code (Vol. XIII., Chap. 4) of the Russian Code of Laws, a translation of which rules and regulations is herewith enclosed.

Owing to the absence of statistics I regret that it is impossible to furnish the information requested in Question 12.

I have, &c.

The Marquis of Salisbury, K.G., &c. &c. &c.

(signed) *Henry Howard.*

(Enclosure.)

MEDICAL CODE, Chapter 4 of Volume XIII. of General Code of Russian Laws.

APPOINTMENT OF MIDWIVES.

Section 156. Matters relating to the appointment, transfer, dismissal, and pay of midwives appertain to the Medical Department of the Ministry of the Interior.

Section 157. Midwives are under the chief jurisdiction of the Medical Department, and subordinate to local medical authorities.

Section 158. In each town of a province or region must be stationed one senior midwife; the number of junior midwives is determined according to the number of districts in a province or region. In the capitals of the Empire there is an established number of midwives attached to each police district.

Section 159. At Odessa there are two officially-appointed midwives.

LAW RESPECTING APPOINTMENT OF MIDWIVES—*continued.*

Section 160. In each of the Siberian provinces, and in Bessarabia, there is a senior midwife attached to the respective medical boards, and one junior midwife in each district or Siberian Circuit; in addition to these, there is one junior midwife in every populous town.

Section 161. In the maritime region of Eastern Siberia there is one senior, and in the township of Kiakhta one junior midwife.

Section 162. To the Inner Kirghiz Horde a midwife is attached, with the same rights as are generally accorded to midwives in the service of the State.

Section 163. Midwives are stationed at all the central and at some of the private quarantine ports and barriers, where they are provided for as part of the regular staff.

Section 164. The examination of midwives is conducted by the Medico-Chirurgical Academy and universities, according to the rules laid down in Section III., Part I., Sections 479-481 of this Code.

Note.—The female pupils of the Institute of Midwifery attached to the Lying-in Asylum of the St. Petersburg Foundling Hospital are subjected to examination for the calling of a midwife in accordance with the rules laid down in the statutes of that institution.

Section 165. The Ministry of the Interior may appoint midwives in excess of the regular establishment, and with the rights attached to Government employ, in all places where their services may be found necessary, and in the same manner as laid down for extra surgeons and surgeons' assistants in Sections 82, 84, and 109.

Section 166. Anyone desirous of following the calling of a midwife must present a certificate of conduct, and know how to read and write one of the most diffused European languages.

Section 167. A midwife appointed to an established post must be of good moral conduct, modest, sober, experienced in her profession, and true to the oath taken by her when entering the service of the State.

Section 168. The issue of certificates of competency to midwives is effected by the Medico-Chirurgical Academy, or the universities by which they have been examined.

Section 169. Midwives may have pupils, but until such pupils have obtained a certificate of competency they may only deliver women in the presence of a midwife.

Section 170. Each midwifery pupil must be able to read and write, and not be younger than 18 years.

Section 171. A pupil who shall have exhibited a sufficient knowledge of midwifery may receive a license of midwife according to the provisions of Sections 479-481 of this Code.

Section 172. A duly-licensed midwife, on presentation of her license, shall at once be excluded from the taxpaying class to which she may have belonged.

SECTION II.

DUTIES OF MIDWIVES.

Section 173. A midwife who has not retired from the practice of her profession must, at all time of the day or night, whatever the position of the person requiring her services may be, answer a call at once, provided legal causes do not prevent her doing so, and on reaching the person to be confined she must be kind, active, observing reticence, especially in cases where secrecy is necessary.

Section 174. When a midwife shall be called and attends to confine a woman, poor and of the lower class, and whose pains of labour may be soon expected, or which may have already commenced, she must on no account, if summoned at the time to some other woman, rich and of good social standing, or one of her acquaintances, leave her first patient, unless the latter consent to be left in charge of a substitute, who in such case must be a properly-qualified and skilful midwife.

Section 175. A midwife must not leave her patient before the process of parturition is terminated, and everything done that is necessary after the confinement.

Section 176. When the midwife shall perceive that the confinement will be a severe one, she must summon the town accoucheur or his assistant, and, in case of their absence, another experienced midwife for consultation, in order that no time should be lost in useless expectation, and thereby danger in the case increased.

RUSSIA—*continued.*

LAW RESPECTING DUTIES OF MIDWIVES—*continued.*

Section 177. The other cases in which a midwife must summon a doctor or accoucheur are the following :—

(1.) When twelve hours after the water has broken the child has not been born, and all ordinary methods for placing it in a proper position have proved unavailable.

(2.) When, on the appearance of the navel or limbs of the child, all manual efforts to deliver the child are unsuccessful, and also when the child remains in the neck of the womb in a position preventing its birth.

(3.) In case of severe hæmorrhage before or after the birth; also in severe cases of miscarriage.

(4.) In convulsions or cramps during or soon after birth, the midwife must summon the nearest doctor, and at the same time communicate with the accoucheur.

(5.) When it shall be observed that the placenta adheres to the aperture of the womb.

(6.) If after the birth of one child it be found that there is another in the womb, the midwife must at once summon an accoucheur.

(7.) When the placenta does not appear on the expiration of one hour after birth.

Section 178. It is the duty of the midwife to explain to the accoucheur or doctor all that has taken place, and the present condition of the case; all orders he may consider it necessary to give must be scrupulously carried out by the midwife.

Section 179. When a monstrosity shall be born, having no semblance to human form, the midwife present at the birth shall not extinguish its life, but carefully report the case to the Town Accoucheur or Medical Board, according to convenience of locality.

Section 180. When a woman shall have died before giving birth to a child a short time before the appearance of a midwife, or in her presence, the latter must immediately report the case to the accoucheur, nearest doctor or surgeon, in order that by means of a proper surgical operation the life of the child may, by extraction, be preserved.

Section 181. A midwife shall, in the capitals, furnish monthly the Town Accoucheur, and in the provinces the Medical Board, with a report of the number of live and dead children at whose delivery she has assisted, specifying the sexes and the cases worthy of note.

Section 182. Midwives may, in accordance with the instructions given them during their course of study, prescribe simple remedies, such as rosemary, camomile, almond oil, manna, rhubarb syrup and cinnamon water; as also the ingredients for poultices and injections.

Section 183. In severe cases of child-birth the midwife, except cutting the umbilical cord, must not venture on any surgical operation; but when necessary immediately demand the presence of an accoucheur, or, in his absence on legal grounds, the nearest doctor.

Section 184. A midwife must not, at the request of any person soever, employ means for producing premature child-birth, but is bound in cases of miscarriage and premature birth to render every possible assistance. Whenever she is asked to bring about premature child-birth, she must immediately report the matter to the proper authorities.

Section 185. Midwives are prohibited from engaging in medical practice; they may, however, treat complaints of women and children in localities unprovided with medical practitioners.

Section 186. Each midwife who shall discharge her duties with zeal and fidelity is entitled to the support and protection of the chief civil medical authorities; a careless midwife, and one who has exceeded her duties, shall be dealt with with all rigour of law.

Section 187. In order that pupils should pay proper attention to their studies, a midwife shall present a monthly report respecting them to the Town Accoucheur or Medical Board, specifying their names, conduct, and diligence.

Section 188. Midwives must not refuse their assistance when summoned by unlicensed midwives; on the contrary, they are bound to give them proper advice, and to endeavour

Law respecting Duties of Midwives—*continued.*

to enlighten them as to the proper treatment of women in child-birth and infants, and to dispel their ignorance and point out the danger of their erroneous processes; unlicensed midwives of intemperate habits must be reported to the authorities.

Section 189. The provisions of Sub-Sections 176, 177, 180, and 183, respecting the summons of a doctor or accoucheur by town midwives, refer equally to district and rural midwives, who, in the cases referred to, must summon the District Surgeon or Accoucheur of the nearest Medical Board.

Examination for the Calling of Midwives.

Section 479. Persons desirous of acquiring the grade of midwife must not be younger than 20 or older than 40 years.

Section 480. In addition to the certificate demanded in Section 442 (as to place of birth, religion, conduct, course of study, &c.) the candidate must present a further certificate that she has delivered at least three infants at a lying-in hospital, or in the course of private practice, in the presence of a medical man; the certificate must also show with what success her deliveries were attended.

Section 481. The candidate is then examined in all those branches of midwifery, a knowledge of which is necessary to a midwife; and lastly she must demonstrate a knowledge of her calling on a model figure, as also at child-birth in a lying-in hospital, where such an institution exists.

NORWAY.

Answers to Questions respecting the Registration of Stillbirths, &c., in Norway.

1. The registration of stillbirths in Norway was enforced by a Memorandum of the Board of Trade, dated 18th November 1797, and has been compulsory since.

2. The registration is carried out by the clergy and by representatives of regularly constituted congregations of dissenters, after notice from medical men, midwives, and other accoucheurs.

3. They are registered separately, neither as births nor deaths. (Children dying within 24 hours are registered both as births and deaths.)

4. By stillbirth is understood "a fœtus capable of vitality, but born without life."

5. For omitting to give notice midwives are punished by fines. In regard to medical men and clergymen, the omission to give such notice comes under the general penal code for neglect of official duties, and involves either fines or loss of office. For similar omission on the part of an uncertified midwife it has not been considered right to establish any punishment.

6. The number of stillbirths in 1890 was 1,657.

7. If the crime be committed by the woman herself, or with her consent, the punishment is from six months' to three years' hard labour. If it be committed without her knowledge or against her will the criminal is liable to nine to 12 years' hard labour. If the woman be injured or lose her life thereby the punishment is increased to the penalty of death.

8. The prescribed notice forms and the form of the entry to be made in the parish register are as follows:—

Answer No. 8—*continued.*

NORWAY—*continued.*

COPY OF NOTICE FORM FOR MIDWIVES, ACCOUCHEURS, AND MEDICAL MEN.

Notice of a Stillbirth or of an Infant that died within 24 hours after delivery, at the birth of which the undersigned has been employed.

NAME OF PARENTS.	Residence and in what Parish or Town	When did the Birth occur?	In which Calendar Month of Pregnancy (about) was the Fœtus born?	Of which Sex was the Fœtus?	What is supposed to have been the cause of the Mother's Premature Delivery?	Did the Fœtus come forth easily, with difficulty, by turning, or by aid of instrument?	Was there life in the Fœtus when it was born?	How long did life exist? or did the stillborn Fœtus show signs of decomposition?	Was any, or what kind of, means made use of to animate the Fœtus, or keep life in it, or not, and why not then?	Has the Mother given Birth to such Children before?

In accordance with the Parish Register as shown at page Marriage Parsonage the fœtus was born it is hereby certified that the above-mentioned

Parish Priest at

That the above written accoucheur is { a certified midwife / an uncertified } certifies

District Surgeon.

E 0.85.

COPY OF FORM OF ENTRY IN REGISTER.

Year

STILLBIRTHS OF MALE SEX.							STILLBIRTHS OF FEMALE SEX.						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
No.	Date of Birth.	Whether born legitimate or illegitimate.	The full name of the Parents and their position in society (livelihood).	Residence.	The year of birth of the Parents.	REMARKS, such as: When and by whom the Notice has been given.	No.	Date of Birth.	Whether born legitimate or illegitimate.	The full name of the Parents and their position in society (livelihood).	Residence.	The year of birth of the Parents.	REMARKS, such as: When and by whom the Notice has been given.
					Father's. Mother's.							Father's. Mother's.	

9. A certificate of a stillbirth, signed by the midwife, is accepted by the registering authorities.

10. Midwives are recognised by the State, and are appointed by the Prefects. With regard to the extent to which the certified midwives are employed at births, only a few statements from certain parts of the country are available. It certainly is the case that in towns midwives are employed in the majority of cases; but in remote mountain settlements and in the most northerly rural districts they are only called into requisition in the case of one-third to one-fifth of the births that occur.

11. *See* Question 10. Midwives who desire a permanent appointment must pass an examination at a public midwifery school, one of which is established in Christiania and another at Bergen. Midwives are under the control of the Official Civil Service.

12. According to the medical statistics, out of 1,000 lying-in women 6·0 died in 1889, and 5·1 in 1888.

SWEDEN.

REPLIES to Questions respecting the Registration of Stillbirths in *Sweden.*

1. Registration of stillbirths is compulsory. A circular was issued on 27th April 1860 to the church body with regard to the keeping of registers. Paragraph 1 Section 2 says: "The sex and origin (*i.e.* born in wedlock or not) of stillborn children is to be "entered in the column for Christian names, no Christian name to be entered."

2. Stillbirths are registered by the parish priests, as are all births.

3. As births, not deaths.

4. There is no legal definition of stillbirths, but the universal definition in Sweden is, "A stillborn child is one that after birth is not observed to show any signs of life."

5. There are no special penalties for neglecting to register a stillbirth. A Royal Ordinance of 11th February 1887 on the Registration of Births states that within six weeks of birth, whether a child has or has not been baptized, it shall be registered under a penalty of five (5) shillings, besides fresh penalties if fresh delay takes place.
How far this applies to stillbirths is uncertain.

6. In 1890, 3,557 stillborn children were registered, and probably all were interred, though without the regular burial service.

7. A mother who by internal or external means seeks to effect an abortion or stillbirth is punished with hard labour for not less than two and not exceeding six years.
Whoever helps her to effect the above receives the same punishment, and also deprivation of civil rights for life or for a certain time.
Whoever illtreats a pregnant woman so that abortion or premature birth be caused shall be imprisoned with or without hard labour for a period not exceeding four years.

8. The usual form of birth registry is as follows; it contains columns for legitimate and illegitimate stillborn children:—

EXTRACT from Birth Registry of 189 , Parish of , Rural Deanery of
Bishopric of , Province of

Number of Entry in Current Year.	The New-born Children's Birth.		The New-born Children's Sex.		Children Born Alive. Christian or First Name.	Children Born Alive. Position. Legitimate.		Children Born Alive. Position. Illegitimate.		Children Born Dead. Legitimate.		Children Born Dead. Illegitimate.		Parents' Name, Trade, Profession, Position, Domicile, Nationality, and Religion (if Dissenters) and place where the Confinement took place, if not at Place of Domicile.	If the Child be of Noble Birth.	Mother.					If the Person assisting at Confinement had passed an Examination.	Notes—such as Name of Person baptizing, Certificates sent or received, &c.
	Year and Month.	Day.	Male.	Female.		Male	Female.	Male.	Female.	Male.	Female.	Male.	Female.			Married.	Widow or Divorced.	Engaged to be Married.	Not Married.	Age last Birthday.	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.

9. A certificate

SWEDEN—*continued.*

9. A certificate of a stillbirth signed by a midwife is fully accepted by the registering authorities.

10. Yes.

11. The regulations contained in the law of 28th November 1856 and the proclamation of 5th November 1880.

The regulations of 1856 deal with the training, inspection, duties, privileges and responsibilities of midwives.

Midwives are trained in institutions at Stockholm, Gothenburg and Lund. The course of instruction lasts at least nine months. An examination is passed at the end of this period, and a license is granted to those persons who have satisfied the examiners.

The Board of Health is entrusted with the duty of inspecting midwives throughout the whole kingdom.

The inspectors are the provincial district and urban physicians, and the teachers in the institutions for training midwives.

An inspector is empowered to suspend a midwife.

Provision is made for aged and infirm midwives.

No person who has not been examined and duly licensed according to the regulations may be employed, except in cases where a physician or licensed midwife is not within reach.

Midwives are usually paid by the parish and also receive a fee from patients according to the means of the persons in question.

At the close of the year 1889 there were 2,508 licensed midwives in Sweden.

The full text of the regulations is as follows :—

REGULATIONS under which Midwives are allowed to practice in *Sweden.*

I. A certificate of competency, and of having passed her examination, does not give a midwife the right to practice until a note has been made on the certificate that the oath of office has been duly taken by her.

II. All midwives in Sweden are under the control of the Board of Health.

Their immediate superiors are the appointed provincial district or town doctors.

Besides the supervision thus exercised by the appointed town doctors, it shall be the duty of the instructors of midwifery, in those towns where such instructors exist, carefully to watch all midwives practising in those towns both as regards the exercise of their profession and also as regards their general behaviour.

III. Their immediate superior, *i.e.* the appointed provincial district or town doctor, may, when occasion offers, but not more than once a year, and in the country, as a rule, only when he finds himself, while travelling officially, in the neighbourhood of the midwife's residence, call her up for examination in the presence of witnesses.

If it should then appear that the midwife has, in some material point, forgotten what she has learnt, or is ignorant of what she ought to know, the doctor may send a report, signed by the witnesses, and giving the reason for the holding of the examination, to the Board of Health, which latter, if they think necessary, may forbid her to exercise her profession on pain of a fine, until she shall have successfully passed a fresh examination either before the doctor in question or before a competent medical school.

A similar prohibition may be imposed if the midwife, by faulty action in the exercise of her art, betrays forgetfulness of what she has learnt or contumaciously fails to present herself for examination.

IV. When a midwife takes up her residence in a parish, or moves from one place to another, she must announce the fact within a month to the nearest appointed doctor, and exhibit her certificate.

In towns a midwife must put up a notice board outside her residence; she must not absent herself from home without leaving particulars with the people there as to where she may be found if wanted, and at what o'clock she will probably return. Or she may write these on a piece of paper fastened to the door.

SWEDEN—*continued*,

Answer No. 11—*continued*.

V. A midwife must not, without proper reason, fail to go as soon as possible to any confinement to which she is called. If she be already sent for to some other confinement expected to occur shortly, or if she be already at another confinement where her services cannot be dispensed with, then she shall send the messenger on to some other midwife, or if there be no other in the place, she shall inform herself carefully of the circumstances, and give directions as to what should be done until she can come herself.

VI. When a midwife goes to an expected confinement, she shall without fail take with her the different instruments which are enumerated in this official list, and also take such drugs, either for strengthening the mother or child, or for stopping dangerous bleeding, as may be immediately required, and which she is entitled to use.

VII. When once the confinement is in process the midwife may not, without extraordinary necessity, leave the woman she is attending, before all that is connected with a confinement be finished, so that the midwife's assistance is no longer, for the time being, specially needed.

VIII. Should the midwife, during the confinement, find that there is some danger for the life of the woman or the child, she should cautiously, and in good time, warn the nearest relations (belongings), and according to circumstances advise the calling in of a doctor or consultation with some other neighbouring midwife.

IX. The midwife shall kindly and carefully tend and nurse the woman confined and the baby, and continue to do so as long as circumstances require and allow. When her assistance is no longer requisite, she should leave advice for the nursing of the mother and the baby. If the latter be weak the midwife may baptize it.

X. Such midwives as have passed an examination in obstetrics with instruments may only use them in cases where a doctor's help cannot be obtained at the right time, either owing to distance or owing to the suddenness with which his help is needed.

Every such operation (which is only allowable where it appears that the confinement cannot be effectuated by nature without material danger to the life of the woman or the child, and as regards the use of sharp instruments, only after all milder measures have shown themselves insufficient, as also when there is no reason to think that the child is alive) should, wherever possible, be carried out in the presence of witnesses.

A midwife in the country who has carried out such an operation, must, as soon as possible, but at latest within three days, give in a report to the appointed provincial or district doctor, through the nearest Crown official, written according to the form prescribed by the Board of Health, and giving the reasons for the use of instruments at the confinement, as also an account of the proceedings at the time and of what occurred afterwards. The above report is to be forthwith conveyed by the Crown official to the appointed doctor.

Towards the end of the second week after the operation, the midwife shall send in a report in the same way to the doctor, informing him how the woman is, and what is the condition of the child in case it was not either born dead or died immediately after birth.

A midwife who has conducted an operation in a town where there is an appointed doctor shall similarly report to him on the subject.

XI. Unless by the doctor's orders, a midwife may not employ nor give any other drugs to a woman at her confinement or to the young infant, than such and so used as the instruction book directs, or the doctor prescribes on that particular occasion.

XII. A midwife practising in the country should seek to promote belief in the advantages of vaccination among the labouring classes, and contribute, in so far as she is able, to getting the children in her parish vaccinated within the proper time.

XIII. Should a magistrate or judge require information of a midwife in some trial, she should give it. After carefully thinking over what she has got to say, she should relate conscientiously, and preferably in writing, what she knows really took place, not concealing anything which may serve to clear up the truth of the matter, nor declaring anything, either verbally or in writing, about which she does not possess trustworthy information, or which, peradventure, she cannot understand the value of.

XIV. Except in the cases above named, a midwife is bound to hold secret what honour requires to be concealed. It is her duty to be silent about that which may have been told her in confidence, and besides to be very careful in expressing her opinion on all delicate questions.

If the mother or child are found to be suffering from a venereal disease, the midwife should make the circumstance known to the proper doctor.

XV. Should

SWEDEN—*continued.*

Answer No. 11—*continued.*

XV. Should a midwife be called to a secret confinement, or should she receive a woman expecting confinement in her house who desires to remain unknown, such midwife is forbidden to try and discover the name of the father, or to extract by cajolery or force from the woman any information relating to the matter.

Although the confinement be secret, yet the midwife may neither herself hide or assist in hiding the child.

If the child be dead, she shall at once inform the priest, the local Crown official, and the parish constable. At a secret confinement the midwife should also advise the woman to put down her name and domicile on paper, which, after being sealed up is given to the priest, who shall also, without delay, be informed of the confinement, so that a living child shall be baptised and a dead one buried.

After the above-mentioned paper has been certified and sealed by the priest, the woman should be exhorted, both for her own sake, as well as the child's future interests, to care fully preserve the document.

XVI. When any place has been invaded by an infectious disease, a midwife established there may not quit it without proper permission, nor withdraw from her duties, but she should obediently follow the orders which may be issued by the competent authorities.

XVII. In all towns, as well as in the country where there is a doctor, a midwife may not recommend anyone as wet nurse until such person has obtained a proper certificate of health.

XVIII. Midwives practising in Stockholm, shall, once a year, at a date published in the papers, proceed to the board of health, to attend the reading of the report, which the teacher of midwifery prepares annually, and also give their addresses, and receive such communications as the board of health may have to make to them. No midwife may absent herself from the reception without recognised reason. If, however, there has been such satisfactory reason which prevented her going, then she shall within eight days afterwards present herself to the instructor of midwifery, explain the reason for her absence, give her address, and receive any communication which it may be desired to make to her.

PRIVILEGES OF MIDWIVES.

XIX. No one may be engaged or appointed as midwife to any place except she have passed her examination, and, after receipt of a certificate of competence, have also taken the usual oath of office before the proper authorities.

XX. Except in cases of necessity or where neither a doctor nor a certificated midwife can be obtained, no other person shall consent to be employed to conduct a confinement.

XXI. In the country a midwife is entitled, unless a different agreement shall have been made, to receive such fee as is appointed by the general vote of the parish on the proposal of the parochial board, the fee being paid from the poor rates in the case of people without means, unless the parish decides otherwise. The amount of the fee is independent of the length or shortness of the confinement or its ease or difficulty, nor may any increased compensation be paid on account of instruments having been used.

A midwife who honestly fulfils her duty is legally entitled to receive payment either according to agreement or according to the fixed amount from every person who has recourse to her, and has had the advantage of her services.

RESPONSIBILITIES OF MIDWIVES.

XXII. For an offence against Articles IV., VI., and XVII., a fine is incurred of from 2*s.* 6*d.* to 5*s.* For an offence against Articles V., VII., XI., and XX., the fine is from 5*s.* to 7*s.* 6*d.* For an offence against Artieles XV. and XVI. the fine is 15*s.*

A midwife who carries out an accouchement with instruments, without having passed her examination in instrumental obstetrics, is fined 25*s.*

In all the above offences the midwife shall be responsible before the ordinary law, should the woman or the infant suffer any injury through the midwife's fault, besides having to pay the fines mentioned.

XXIII. Should the midwife neglect to ask in time that a doctor or another neighbouring midwife be called when there is danger for the mother's or the infant's life, or if she opposes their being called, and then a misfortune happens which she ought to have been able to foresee, the midwife shall be regarded as being the cause of the misfortune.

 XXIV. A midwife

Answer No. 11—*continued.*

XXIV. A midwife in Stockholm who, without lawful excuse, neglects to present herself before the board of health at the yearly meeting, loses her number and her right to practice, until she have purged her fault and been re-admitted.

XXV. Any person, except in cases of necessity, or where neither a doctor nor a certificated midwife are obtainable, who employs an uncertificated person to carry out an accouchement, shall be fined 7*s.* 6*d.*

XXVI. A fine of 25*s.* shall be payable by any person who accepts or appoints, as midwife for any place, a woman who has not properly proved herself entitled to practise midwifery as laid down in Article XIX.

XXVII. A parish which pays a midwife is entitled, in drawing up a contract with her, to insert fines to be imposed for neglect of any specified important rules, although no punishment is specially mentioned in these regulations.

XXVIII. Fines paid under these regulations will be divided, unless any rule to the contrary be made, between the informer and the poor of the parish; in Stockholm, between the informer and the "Fund for Distressed Midwives."

XXIX. When a midwife is prosecuted for a fault in the exercise of her profession, judgment may not be pronounced until the opinion in the case of the board of health has been obtained.

XXX. A midwife who has been punished for theft, forgery, or other felonious action, shall for ever lose her right to practise the midwives' art.

XXXI. The board of health can suspend a midwife from practice for a certain time, in cases where she has been judicially punished for repeated acts of drunkenness or immorality.

XXXII. In every case where the public prosecutor prosecutes a midwife, it is his duty to inform the board of health of the decision come to by the court.

12. TABLE showing Number of Deaths in Childbed.

	Number of Deaths of Women.	Number of Deaths in Childbed.
1889 - - - - - - -	38,380	216 or 5·6 per 1,000
1888 - - - - - - -	38,020	231 or 6·0 „
1887 - - - - - - -	37,902	265 or 7·0 „
1886 - - - - - - -	38,883	256 or 6·5 „
1885 - - - - - - -	40,926	285 or 6·9 „
1884 - - - - - - -	40,038	241 or 6·0 „

There are no statistics as to the number of women who die in the four weeks immediately following their confinements.

DENMARK.

ANSWERS to Questions respecting the Registration of Stillbirths, &c., in *Denmark*.

1. The registration of stillbirths is compulsory; by the law of 28th September 1877, and by the law of 2nd January 1871, the body of an infant stillborn must be viewed by the midwife or doctor who has been called in to attend at the birth.

2. The registration is carried out by the authorities, who register ordinary births and deaths.

3. Stillbirths are entered in a special column in the register of deaths as stillbirths (Danish dödfoot).

4. By a stillborn child is understood a child which has issued forth from its mother's womb after the expiration of the 28th week of gestation as dead, or as apparently dead, and is not called back to life.

5. In the case of the parents a fine not exceeding 10 kr., and in the case of the midwife a fine not exceeding 100 kr. is imposed for neglecting to register a stillbirth.

6. The number of children stillborn in Copenhagen in 1890 was 349.
The latest available statistics for the whole country gives the total number of births throughout Denmark during the five years, 1885-89, as 347,421; of these 9,666 were stillbirths, or 2·8 per cent.

7. From two months' imprisonment to hard labour for life, as appears from the following extracts from the Law of 10th February 1866.

> Section 193. A woman who is with child, and who wilfully expels her fœtus, or kills it in its mother's womb, is punished with hard labour not exceeding eight years. The same punishment is applicable to him who, with the mother's consent, with this aim, uses means on her with the above-mentioned result.
>
> If it takes place without her knowledge and consent, the person who commits the crime is punished with hard labour from 4 to 16 years; if under specially aggravated circumstances, for life.
>
> Section 194. When a woman is with child out of wedlock, and brings forth in secret, and the child afterwards is found to be dead without possibility of ascertaining if the death took place before the birth, she is then punished, if the circumstances connected with the case do not involve a severer penalty, with hard labour, or, under extenuating circumstances, with imprisonment, not less than four months.
>
> Section 195. If any woman with child out of wedlock is otherwise guilty of inexcusable negligence at the birth of the child, and the child is afterwards found to be dead, and it cannot be proved that the death took place before the birth, then she is punished with hard labour not exceeding two years, or, under extenuating circumstances, with imprisonment for not less than two months.

8. The regulations respecting midwives, and the form to be used by the midwife for registering stillbirths, are as follows:—

REGULATIONS respecting Midwives.

> Section 12, of Instructions to Midwives from Ministry of Justice, dated 28th September 1877:—
>
> The midwife is bound to keep a register of all births at which she has attended. When she takes up her abode in a district, she must request the district medical officer to supply her with a register in the authorised form, in order to enter therein all births, and in this register she must enter a report of every birth within the first day after she has returned from having attended at such birth, by filling in all the columns in the register so far as she is able to do from the information at that time in her possession; later on she will fill in the other columns. When she is called before her superintendent medical officer she must take this register with her. If the register is finished, or she leaves the district or gives up her practice, she must deliver up her register to the medical officer.

 Section 14. If

DENMARK—*continued.*

Answer No. 8—*continued.*

Section 14. If the child which is born is dead, or apparently dead, the midwife must make a report thereof by filling in the form authorised for this purpose, to be obtained of the superintendent medical officer. If the birth has taken place in Copenhagen, she must deliver this report, after it has been been signed by the city medical officer, at the burial office in Copenhagen.

If the birth has taken place in one of the provincial towns, or in a rural district, she must deliver it to the clergyman of the parish. In the rural district this report serves for a certificate of death of the child, but in Copenhagen and provincial towns a special examination of the body must be made by a doctor, and the midwife must remind the parents of the duty incumbent on them in this respect.

"Denmark; its Medical Organisation, Hygiène, and Demography," published with Subvention of the Danish Government, presented to the Seventh International Congress of Hygiene and Demography, London, 1891.

Page 53. "If the child is stillborn, or born asphyxiated, and the measures taken "fail to resuscitate it, the midwife issues a certificate of death; this has to be done "for children born after the full time, as well as for those prematurely born. In "these certificates the midwife must state not only the supposed cause of death, but "also what means she has employed in order to resuscitate the child. In the earliest "Acts regarding midwives, great stress is laid upon their duties towards the newborn. "Evidently it was the object then, and perhaps much more so than it is now, to "prevent infanticide, or at any rate neglect in the treatment of the newborn babe."

FORM to be used by Midwives in registering Stillbirths.

NOTIFICATION of a Stillborn Child at the Birth of which the undersigned Midwife has assisted.		
1. When did birth take place (day, month, year)?		
2. When childbirth began? When midwife came to woman in labour? When birth was over?		
3. Was child legitimate or illegitimate?		
4. Mother's, and if child is legitimate, father's name?		
5. Residence of mother?		
6. Was child male or female?		
7. Was child full grown, or how many weeks too early is the child supposed to have been born?		
8. Was it a regular vertex presentation? If not, in what consisted irregularity of the birth?		
9. Was the delivery effected naturally, or was any artificial assistance necessary, and if so of what kind?		
10. Were there signs of corruption?		
11. Did the midwife use any, and what means, to resuscitate the fœtus, and if not, why not?		
12. What is supposed to be the cause of the death of the fœtus?		

DENMARK —*continued.*

9. The authorities accept a certificate signed by a midwife, accompanied by a certificate from the medical officer.

10. Midwives are recognised by the State. The practice may be said to be entirely in their hands, though of late years some few medical men have undertaken to attend women in labour.

11. Midwives are allowed to practise under the regulations of the 28th of September 1877 (in 22 sections):—

Section 1. The midwife must obtain certificate of competency, and present herself to the principal medical officer of the place where she intends to practice.

Section 2. [Enumerates in detail the duties of a midwife].

Section 3. She is bound to render services when called on.

Section 4. She must remain in attendance till the birth has taken place, and assist and obey the medical officer, and can only administer anæsthetics under his orders and in his presence.

Section 5. She must remind parents of their duties as regards the registration of births. She may in urgent cases christen the infant in the absence of the clergyman, or father, &c.

Section 6. In case of an apparent stillbirth, she must use all means to recall the child to life, and neglect no means to that end until all hope is lost.

Section 7. She must instruct the mother as to treatment of the child, and when the conditions are such as to endanger the life of the child, she must report the case to the authorities.

Section 8. If the woman confined is attacked by a contagious malady, the midwife cannot refuse to attend her, but must take precautions to avoid infection for herself. If the woman in her confinement is suffering from venereal disease, or it is known to the midwife that she has previously suffered from such disease in any of its constitutional forms, she shall deem the child as suspected of having the disease, even if it do not show any obvious symptoms thereof; she must not give it to be nursed by any other woman than its own mother, without informing such nurse.

If the disease is already present on the child, it must not be suckled by any other woman than its own mother, and must not be given out to nurse without the foster parents having information as to the nature of the disease from which the child is suffering. The midwife must then report to the physician the steps she has taken in the case.

Section 9. If puerperal fever or other contagious disease is present, which might be easily conveyed by the midwife, she must report this to the district medical officer, and use such precautions to prevent the spreading of the disease as he may direct.

Section 10. A midwife must not endeavour to elicit from a woman in her confinement, or who is *enciente*, who is the father of her child. She is further bound to use the strictest discretion as to the pregnancy and confinement of those women who wished it to be kept secret, unless there arises suspicion in her mind that a crime is being committed or is intended.

Section 11. The midwife is not allowed to receive into her house women *enciente*, or in their confinement, without permission of the medical officer, and must submit her house to his inspection while such women are with her. Certain midwives under the inspection of the lying-in hospital are exempt from this regulation.

Section 12. The midwife must keep a register of all births at which she is present.

Section 13. Every midwife in Copenhagen must furnish particulars of stillbirths to the clergyman of the parish in the form authorised by the city medical authority.

Section 14. If the child which is born is dead, or apparently dead, without being afterwards called back to life, the midwife must make a statement to that effect by filling in the column in the form to be used for this purpose. The midwife must not make out certificates of death of children who have lived after birth.

Section 15. A midwife attending unmarried women must carefully mark circumstances which are of importance in judging if the child is not prematurely born, and

Answer No. 11—*continued.*

must take weights and measurements which might be of importance in the case, and put down the results in writing.

Section 16. The immediate superintendent of the midwife is the town or district physician for the commune in which she resides.

Section 17. A district midwife or a reserve midwife has the same duties as a midwife in general practice. Her house must in Copenhagen be marked by a light. Instruments are to be kept clean and in order, and must be produced for inspection by the medical officer when called on.

Sections 18–21. The scale of remuneration is regulated by law, but the midwife is not prohibited from receiving any fee given over and above by the patient of her own free will, but she may not demand such, and she is forbidden when called to attend a birth to make any attempt to obtain a promise of higher payment.

The fees vary from 1 kr. to 8 kr., according to social position of the family. Midwives in private practice outside Copenhagen may, however, demand a higher fee before being called to the parturient. While these latter are dependent upon their earnings from cases of labour for a living, the district midwives have also a salary of 100 kr. to 120 kr. per annum, which may be increased 1 to 60 kr. They are likewise provided with a small dwelling-house, fuel, and fodder for a cow; remuneration in kind may be converted into cash payments.

If discharged on account of old age, they are entitled to a pension of 120 kr. per annum. For neglect of duty a midwife may be summarily punished with a fine from 2 kr. to 200 kr., and may be deprived of her license by decree of the court.

Section 22. Midwives when receiving instruction at the lying-in hospital must be made acquainted with these regulations, and a copy must be furnished to them on leaving.

12. There are no statistics available for supplying the rate per 1,000 of women who die in their confinement, or in the four weeks immediately following; but the following statement shows the deaths of women in their confinements at various ages in 1876–85 for the whole of Denmark:—

	15 to 25 Years.	25 to 45 Years.	45 to 65 Years.	TOTAL.
Puerperal fever - - - - -	161	559	7	727
Annual number of deaths from puerperal fever per 100,000 of living population - - - - -	30	65	1	30
Death during delivery and in childbed -	35	265	2	302
Annual number of deaths during delivery and in childbed per 100,000 of living population - - - -	7	31	—	13

[INFORMATION respecting Canada, Australia and New Zealand has been obtained from the various Colonial Governments through the medium of the Colonial Office.]

CANADA.

PROVINCE OF NOVA SCOTIA.

1. No. Unfortunately at the present time there is no registration of births and deaths in this province. Prior to confederation the Government and Legislature of Nova Scotia had provided a system of vital statistics, including a registration for marriages, births and deaths. After confederation, under the terms of the British North America Act, this Statistical Department naturally fell under the control of the Federal authorities at Ottawa. The Department, as far as Nova Scotia was concerned, was kept up for about 10 years, and then abandoned, and the staff superannuated. Under the British North America Act the "Census and Statistics" constituted one of the subjects assigned to the exclusive jurisdiction of the Federal authorities, and the Government of Nova Scotia has never felt justified in undertaking to carry on such Department; whereas the Federal authorities have omitted doing anything except that recently an Act has been introduced providing for the registration of deaths in towns of over 5,000 inhabitants. This general statement of facts will serve to explain the answers given to the questions following:—

2. No. There is no registration of births and deaths.

3. They are not registered at all.

4. There is no statutable definition in this province.

5. There are no penalties.

6. There are no statistics from which an answer to this question can be obtained.

7. The penalties are laid down in the Dominion Code. Penal servitude for life is the maximum.

8. There are no regulations or forms.

9. There is no registration and hence no certificate.

10. Yes, to both questions.

11. Under the Act relating to the practice of medicine and surgery, it is provided that the Provincial Medical Board shall have power, and it shall be their duty among other things, "To regulate the study of medicine, surgery, and midwifery, by making rules not inconsistent with this chapter, with regard to the preliminary qualification, course of study to be followed, the final examination, and the nature of the evidence to be produced before board upon these subjects." The Act also contains this further provision:—

"Nothing in this chapter shall prevent any competent female from practising midwifery in Nova Scotia, except that any such female must satisfy the Provincial Medical Board of her competency and obtain a certificate from the registrar to that effect before she can lawfully practise as aforesaid in the city of Halifax."

12. There are no statistics in this country whereby such rate can be accurately estimated.

PROVINCE OF QUEBEC.

1. The registry of stillbirths is not compulsory in this province.

2. No.

3. Stillbirths are not registered.

4. There is no definition of a stillborn child in our provincial Statutes.

5. None.

6. The number of stillborn children in the year 1890 is not known.

7. Criminally causing a child to be stillborn would probably be an offence under Chapter 162 of the Revised Statutes of Canada, Sections 47, 48 and 49, relating to the crime of abortion.

8. There are none.

9. No.

CANADA—PROVINCE OF QUEBEC—*continued.*

10. Midwifery is recognised by Article 3987 of the Revised Statutes of the Province of Quebec, but I do not think that the bulk of the midwifery practice is in their hands.

11. Under regulations made by the Provincial Medical Board; and in the country parts, women obtaining a certificate from a duly licensed physician, certifying that they have the necessary knowledge, can practice midwifery.

12. The number of women who die in their confinement is not known.

NORTH-WEST TERRITORY.

Copy of Despatch from the Lieutenant Governor of the North-West Territory.

Lieutenant Governor's Office, Regina, North-West Territory,
Sir, 4 July 1892.

I AM directed by his Honour the Lieutenant Governor of the North-West Territories to acknowledge the receipt of your letter of the 15th ultimo, No. 2267—2995, transmitting therewith copy of a Despatch, dated 19th May last, from the Right Honourable the Secretary of State for the Colonies, upon the subject of stillbirths, midwives, &c., and requesting such materials as may be available regarding the North-West Territories, for completion of the Return to the House of Commons of the United Kingdom therein mentioned.

His Honour desires me to state, in reply, that in the absence of any local legislation, there is no information upon the subjects mentioned available as far as the territories are concerned.

I have, &c.
The Under Secretary of State, Ottawa. (signed) *R. B. Gordon.*

PROVINCE OF NEW BRUNSWICK.

1 to 7. No information furnished.

8. The form in use is as follows:—

Schedule A.

Births.

Registration division of county

Return of physician, parent, or other person to division registrar.

When and where born - -	
Name and sex - - - -	
Name of father - - - -	
Occupation - - - -	
Maiden name of mother - -	
Name of accoucheur - - -	

Signature of parent, physician, or other person, and Post Office address - - -

Note.—The above Return is to be filled in carefully and accurately by physician, parent, or other person, and forwarded to the division registrar.

9 to 12. No information furnished.

CANADA—*continued.*

PROVINCE OF PRINCE EDWARD ISLAND.

1. There is no statutory law of this province to regulate the registration of stillbirths. The registration is effected under the provisions of a system for collecting mortuary statistics in certain cities and towns of the Dominion, adopted by the Department of Agriculture in or about 1882, and conducted under its control. The system was inaugurated in this city in June 1883, and was continued in operation until December, 1891. The principle of compulsion does not enter into the system, and its operation in this province is confined to this city.

2. There is no statutory law provided for, and in fact there is no official registration of births, either as regards the province at large, or this city. The registration of stillbirths is carried out by the statistical officer appointed for the collection of mortuary statistics.

3. Stillbirths are registered separately from deaths.

4. Apparently there is no legal definition under statutory or common law. Under the system of registration the definition of a stillborn child would be: "A child that has not lived to breathe."

5. None.

6. Two (2).

7. Probably imprisonment, ranging from two years, to "for life."

8. The form in use is as follows :—

	Death Certificate. Certificat de Décès.	City of / Ville de *Charlottetown.* Month of / Mois de *June.*
1.	Name and surname of deceased / Nom et prénom du décédé	*Mary Jones' child (stillborn).*
2.	Sex of deceased / Sexe du décédé	*Male.*
3.	Age of deceased / Age du décédé	*Stillborn.*
4.	Marriage state of deceased / Etat de la personne du décédé	
5.	Religion of deceased / Religion du décédé	
6.	Nationality of deceased / Nationalité du décédé	*English.*
7.	Occupation of deceased or chief of family. / Occupation du décédé ou du chef de la famille.	*Shoemaker.*
8.	Time of death / Date de la mort	The / Le 4*th* of the month of / du mois de *June* 1892.
9.	Disease or other cause of death / Maladie ou autre cause de la mort	

The / Le 1 of the month of / du mois de *July* 1892.

Signature,

Clergyman of

9. A returning

9. A returning officer would accept the affirmation of a midwife, and would certify to the stillbirth, which certificate the statistical officer would record.

10. Midwives are recognised by the State, and a considerable portion of the practice of midwifery is in their hands.

11. The Medical Act, 1892, repealing all former Acts, simply provides in Section 43 as follows: "And nothing in this Act shall be construed to prevent any woman from practising midwifery."

12. About 7 per 1,000.

PROVINCE OF ONTARIO.

1. The registration of all births is compulsory, both still and live births.

2. The same authorities, viz.:—Municipal clerks are required to register all births and deaths.

3. Stillbirths are registered both as births and deaths.

4. The Ontario Registration Act does not define the term "stillborn child."

5. The penalties for neglecting to register stillbirths are the same as those in other births.

6. No separate enumeration of stillbirths, born, interred, and registered in Ontario in 1890 has been made.

7. The following provisions relating to the offence of criminally causing a child to be stillborn are contained in Rev. Stat. Can., cap. 162, secs. 47 and 48:—

> "(47.) Every woman, being with child, who, with the intent to procure her own miscarriage, unlawfully administers, or permits to be administered to herself any poison or other noxious thing, or unlawfully uses or permits to be used on herself, any instrument or other means whatsoever with the like intent; and
>
> "Everyone who, with intent to procure the miscarriage of any woman, whether she is or is not with child, unlawfully administers to her or causes to be taken by her any poison or other noxious thing, or unlawfully uses any instrument or other means whatsoever with the like intent,
>
> "Is guilty of felony, and liable to imprisonment for life.
>
> "(48.) Everyone who unlawfully supplies or procures any poison or other noxious thing, or any instrument or thing whatsoever, knowing that the same is intended to be unlawfully used or employed with intent to procure the miscarriage of any woman, whether she is or is not with child, is guilty of misdemeanour, and liable to two years imprisonment."

8. No special forms of certificates have hitherto been utilised in this Province for the registration of stillbirths.

9. The certificate of any of the several persons having management of the birth can be accepted in Ontario.

10. There is no Act in this Province recognising midwives, and the bulk of the practice is not in their hands.

BRITISH COLUMBIA.

1 to 6. Stillbirths are not registered.

7. Imprisonment for life (Rev. Stat. Can., cap. 162, sec. 47).

8 and 9. Stillbirths are not registered.

10. No statute dealing with the subject.

11. No regulations.

12. No information available.

MANITOBA.

Detailed replies to the several questions are not procurable, but it appears that the law in relation to the registration of stillbirths in Manitoba is almost identical with that in Ontario.

AUSTRALIA AND NEW ZEALAND.

New South Wales.

1. Not compulsory.

2. No registration allowed.

3. Neither.

4. The converse will explain, "a child shall be held to have been born alive if it shall have breathed and have been wholly born into the world, whether it had an independent circulation or not." (46 Vic., No. 17, Sec. 11.)

5. None.

6. Not known.

7. Procuring abortion—liable to ten years.

8. None.

9. There is no such certificate.

10. Midwives are not recognised by the State. A large proportion of the midwifery practice in their hands.

11. There are no regulations.

12. The proportion is not known.

Victoria.

1. No.

2. There is no registration in the strict sense of the word, but deputy registrars of births and deaths are "recommended" to make a note of all cases which come to their knowledge, and the quarterly returns which they furnish to the Registrar-General contain a column for the purpose of showing the number reported.

3. Neither.

4. It is not known that the expression has been legally defined in this Colony, either by statute or judicial decision.

5. None.

6. The number is not known.

7. The provisions of Victorian law with regard to procuring, or attempting to procure abortion, are contained in Sections 55 and 56 of the Crimes Act 1890. Penalty, not exceeding fifteen years' imprisonment, upon "every woman being with child who with intent to procure her own miscarriage shall unlawfully administer to herself any poison or other noxious thing, or shall unlawfully use any instrument or other means whatsoever with the like intent, and whosoever with intent to procure the miscarriage of any woman, whether she be or be not with child, shall unlawfully administer to her, or cause to be taken by her, any poison or other noxious thing, or shall unlawfully use any instrument or other means whatsoever with the like intent" . . . And not exceeding three years' imprisonment upon "whosoever shall unlawfully supply or procure any poison or other noxious thing, or any instrument or thing whatsoever, knowing that the same is intended to be unlawfully used or employed with intent to procure the miscarriage of any woman whether she be or be not with child."

8. No regulations nor certificates.

9. No certificates.

10. Midwives, as such, are not recognised by law, and no restrictions are imposed on them. For neglect or malpractice ending fatally they would be liable to the ordinary criminal law, and could be punished for manslaughter.

11. Reply similar to that given to Question 10.

12. The number of child-bearing women per 1,000 who die in, or shortly after, their confinement during the years 1882 to 1891, is given in the last column of the annexed table. It is not known whether they all died within four weeks of confinement, and only those cases in which the children have been born alive have been recorded.

Answer No. 12—*continued.*

DEATHS of Child-bearing Women 1882–1891.

Years.	Number of Deaths from			Number of Births of Living Children.	Number of Mothers who died per 1,000 Children born alive.
	Puerperal Fever.	Other Diseases of Parturition.	Total.		
1882	18	40	58	26,747	2·17
1883	17	37	54	27,541	1·96
1884	33	60	93	28,850	3·22
1885	29	46	75	29,975	2·50
1886	28	53	81	30,824	2·63
1887	38	54	92	33,043	2·78
1888	41	55	96	34,503	2·78
1889	28	44	72	36,359	1·98
1890	37	59	96	37,578	2·55
1891	67	125	192	38,505	4·99
	336	573	909	323,925	2·81

SOUTH AUSTRALIA.

1 to 3.—Stillbirths are not registered in this colony.

4. The Registrar General for the Colony is not aware of any law, though there may be one, under which the definition of a stillborn child is given.

7. The offence is felony (*see* Act No. 38 of 1876), the maximum punishment being imprisonment for life, and the minimum three years' imprisonment with hard labour.

10 and 11. Midwives are not recognised by the State.

12. The Registrar General for the Colony understands this question to be: What is the proportion of women who die from diseases or accidents of pregnancy or parturition to 1,000 women who become pregnant? The only way by means of which even an approach can be made to ascertaining this is by finding the proportion of recorded deaths from the diseases and accidents in question to 1,000 births registered. In the 10 years ended with 1891 the deaths referred to numbered 482, and the births 109,847, the proportion of the former per 1,000 of the latter being 4·39.

The record of births does not, of course, properly represent the number of cases of pregnancy, as abortion, miscarriage, and stillbirths are not followed by birth registration, and this would tend to unduly raise the apparent rate as against the real one. On the other hand, the apparent rate is lowered as against the real one by the fact that cases of twins or triplets show more births than confinements, and the further fact that the record of cases of death from causes arising from pregnancy or parturition is, to some extent, understated owing to insufficient information in the medical certificates. How nearly these opposite causes of error approach to balancing each other is not known.

QUEENSLAND.

1. The registration of stillbirths is not compulsory in Queensland. There is no Act on the subject.

2. Answered by reply to No. 1.

3. Same reply.

4. It is not known what is the legal definition of a stillborn child, but the Registrar General and the district registrars in this colony require that the birth or death of any child who has once breathed, or who after birth has shown any sign of life whatever, should be registered.

5. Answered by reply to No. 1.

6. The number of stillborn children interred in Queensland during 1890 is not known.

7. Attempt to procure abortion either by the mother of the child or by any other person is punishable at the discretion of Court by penal servitude for life or for any term not less than three (3) years, or to be imprisoned for any time not exceeding two (2) years with or without hard labour or solitary confinement (26 Vict. No. 11, s. 59).

8. *Vide* answer to Question No. 1. No regulation or forms of certificate used. The authorities in charge of the various public cemeteries require a certificate of the midwife or doctor in attendance at birth that the child was stillborn before they admit the body to the cemetery for interment.

9. *See* reply to Question No. 8.

10. No. It is thought that in cities and large centres of population the bulk of the midwifery practice is not in their hands. In outlying country places, where the services of a doctor cannot be easily procured, the case is different.

11. There are no regulations bearing on this subject.

12. The actual number of confinements is not known, but the death rate in Queensland per 1,000 women whose death in childbirth has been registered on certificates by medical practitioners or otherwise during the year 1890 was 4·10, calculated on 1,000 births registered, and an allowance having been made for stillbirths.

WESTERN AUSTRALIA.

1. Stillbirths are registered under the Act for registration of births, deaths, and marriages, 19 Vic. 12.

2. Yes.

3. Both as births and deaths.

4. There is none.

5. Similar to those for other births.

6. Yes, sixteen stillbirths were registered.

7. As for attempting to procure abortion.

8. No

8. No regulations. The form in use is as follows:—

Form No. 265. REGISTER OF BIRTH.

(CAUTION.—Nothing whatever, besides the particulars directed to be recorded, should be written on this form. Memos. and explanations, when any are necessary, should be on separate paper.)

No.	When and where born.	Name (if any).	Sex.	Name and Surname of Father.	Name and Maiden Surname of Mother.	Rank or Profession of Father.	Signature, Description, and Residence of Informant.	When Registered.	Signature of Registrar.	Baptismal Name if added after Registration of Birth.

9. Midwife's certificates not required.

10. No State recognition.

11. No regulations.

12. No return. During the last 10 years (1882-1891) 42 women are registered as having died in childbirth.

(signed) *Malcolm A. C. Fraser.*
Registrar-General.

27th June, 1892.

TASMANIA.

MEMORANDUM for his Excellency the Governor.

Premier's Office, Hobart.
15 August, 1892.

In reply to the enquiry from the Home Office forwarded by the Secretary of State's despatch No. 23 of the 19th May, respecting stillbirths, midwives, &c., the Premier has the honour to inform your Excellency that the registration of stillbirths is not compulsory in Tasmania, but in any case where a parent desires to register such occurrence, the application, so far as Hobart is concerned, is not refused, the registration being effected on the production of a certificate of a medical man or some known midwife, a special register being kept for this purpose.

No legislation has up to the present time been made in any way bearing upon the registration of those practising as midwives in the Colony.

In the year 1891, out of 4,971 births registered, there were thirteen cases registered as deaths from diseases of parturition.

A draft Bill has been prepared for the current session of Parliament in which provision is made for the compulsory registration of all stillborn children.

Brown.

NEW ZEALAND.

1. Stillbirths are not required to be registered.

2. No registration exists.

3. Not registered either as births or deaths.

4. None of the New Zealand Acts define a stillborn child. We depend on English Acts and cases for an interpretation of the term.

5. No penalties, registration not being required.

6. Number not known.

7. We have no specific provisions in regard to criminally causing a child to be stillborn. The law of the Colony is contained in the "Offences against the Person Act, 1867," Secs. 55 and 56, which are practically reprints of the English provisions, 24 and 25 Vic., cap. 100, secs. 58 and 59.

8. None in existence.

9. No registration of stillbirths.

10. There is no registration of midwives. Probably medical practitioners have most of the practice.

11. No regulations touching midwives.

12. For the year 1890, the rate was: 1 death to every 184 children born, or allowing for twin and triplet births, 1 in every 182 child-bearing women died.

UNITED STATES.

[The information respecting the United States has been obtained from Her Majesty's Representatives in America, through the medium of the Foreign Office.

Her Majesty's Consul at Chicago, in sending replies with regard to the States of Colorado, Dakota, Illinois, Iowa, Kansas, Minnesota, Missouri, Montana, and Wisconsin, remarks :—

"I regret that the State Boards of Health have not in general responded to my inquiries, and I am therefore unable to furnish a complete return."

And with regard to the States of Massachusetts, Vermont, New Hampshire, and Maine, Her Majesty's Consul at Boston observes :—

"From a careful study of the laws of each of the four States comprised in this district, and searching inquiries of the authorities, I find that this subject has not received full attention, for whilst legislation is either obscure or entirely absent on many points of interest connected with it, the opinion of executive officers is not uniform on some of the questions which it involves. These facts may account for the uninstructive character of my Report, and for the small value to be attached to its suggestiveness."]

Alabama.—City of Mobile.

1. Yes. Sections 118 and 119 of An Ordinance to Secure Public Health, made by the Mayor and General Council of the City, are as follows :—

Extract from Annual Report of the Board of Health of the City of Mobile, for the year 1889.

The Registration of Deaths and Births.

Section 118. Be it further ordained, that the Health Officer shall keep a book, to be entitled, "The Register of Deaths," in which he shall make a registration of all deaths occurring in the city, under such regulations as may be prescribed by the Board of Health. Designating such as are paupers. That he shall supervise all certificates of death, to see that they are properly made out; the form of the certificate and the nomenclature of the disease to be such as may be prescribed by the Board of Health. That if the certificate is in proper form, he shall issue a permit authorising the removal or burial of the body of the dead person; and without such permit, no person who may die in the City of Mobile, shall be removed or buried by any sexton, undertaker, or other person, under such penalty as the Mayor may impose, not exceeding fifty dollars. That if the certificate of death is in any way defective, he shall return it to the physician signing the same, for correction; and any physician failing or refusing to give such certificate in proper form, shall be liable to such penalty as the Mayor may impose, not exceeding fifty dollars. That in all cases of death in which no adequate certificate can be obtained from a physician, the coroner shall investigate the circumstances and make out the certificate required. That no dead body of any deceased person shall be brought into the City of Mobile from any other place unless it is accompanied by a proper certificate of the cause of death; and if the death was caused by small-pox, yellow fever, or any other infectious or pestilential disease, not unless the permit of the Board of Health has been first obtained, under such penalty as the Mayor may impose, not exceeding fifty dollars.

Section 119. Be it further ordained, that every physician and every midwife, and every other person who may attend any case of midwifery, within the limits of the City of Mobile, shall make to the Health Officer a report of every such case within one week after the date of its occurrence, specifying the names of the parents, the date of the birth, and the sex and colour of the child, under such penalty for failure so to do as the Mayor may impose, not exceeding fifty dollars; and these reports shall be recorded by the Health Officer in a book to be kept for that purpose, and to be entitled, "The Register of Births."

2. Yes.

3. As stillbirths only.

4. One dying before complete separation from the mother.

5. See Section 118 of Annual Report of the Board of Health before set out.

UNITED STATES.—ALABAMA.—CITY OF MOBILE—*continued.*

6. Yes; 114, as appears from the following extract from the Annual Report of the Board of Health of the City of Mobile for the Year 1891.

TABLE NO. 8.—STILLBIRTHS REPORTED.

Months of Year 1891.	White.		Coloured.		Total.
	Male.	Female.	Male.	Female.	
January	3	2	4	5	14
February	2	—	2	3	7
March	2	—	7	5	14
April	6	—	3	1	10
May	1	1	6	2	10
June	—	1	2	1	4
July	1	2	3	2	8
August	—	1	3	2	6
September	2	1	3	1	7
October	1	1	3	3	8
November	2	2	5	2	11
December	3	4	2	6	15
Total	23	15	43	33	114
Total	38		76		114

7. Same penalties as for murder.

8. No special form for stillbirths. The following are the forms in use :—

FORM A.

No.

HEALTH DEPARTMENT OF THE CITY OF MOBILE.

RETURN OF A DEATH.

ARTICLE III.—The Registration of Deaths and Births.

Section 8. Be it further ordained, that the health officer shall keep a book, to be entitled, "The Register of Deaths," in which he shall make a registration of all deaths occurring in the City, under such regulation as may be prescribed by the Board of Health. That he shall supervise all certificates of death, to see that they are properly made out; the form of the certificate and nomenclature of the disease to be such as may be prescribed by the Board of Health. That if the certificate is in proper form, he shall issue a permit authorising the removal or burial of the body of the dead person, and without such permit no person who may die in the City of Mobile, shall be removed or buried by any sexton, undertaker, or other person, under such penalty as the Mayor may impose, not exceeding fifty dollars. That if the certificate of death is any way defective, he shall return it to the physician signing the same, for correction; and any physician failing or refusing to give such certificate in proper form, shall be liable to such penalty as the Mayor may impose, not exceeding fifty dollars. That in all cases of death in which no adequate certificate can be obtained from a physician, the health officer shall investigate the circumstances and make out the certificate required; except in such cases as may require the intervention of the coroner, when that officer shall be duly notified. That no dead body of any diseased person shall be brought into the City of Mobile, from any other place, unless it is accompanied by a proper certificate of the cause of death; and if the death was caused by small-pox, yellow fever, or any other infectious or pestilential disease, not unless the permit of the Board of Health has been first obtained, under such penalty as the Mayor may impose, not exceeding fifty dollars.

N.B.—All the blanks on this form must be accurately filled, with ink, signed by the undertaker, and delivered with the "Physician's Certificate," at the office of the Board of Health, within twenty-four hours after the death of the person to whom it relates.

Name in full

Date of Death

Place of Death, Ward,

Street and No.,

Time of Residence in the City,

Place of previous Residence,

If a Minor { Name of Father,
Name of Mother,

Place of Birth,

Age, years, months days.

Sex, Colour, Occupation,

Married, single, or widowed?

Name of Physician,

To be interred in Undertaker.

Answer No. 8—*continued.*

FORM B.

No.

HEALTH DEPARTMENT OF THE CITY OF MOBILE.

RETURN OF A BIRTH.

N.B.—If the child be stillborn or has died since birth, state the facts under "Remarks," also in case of duplicate births, and fill a separate blank for each child. Reports of births must be made before 12 o'clock Saturday.

Date of Birth,
Sex of Child, Colour,
Part Presenting,
Place of Birth, Ward,
Street and No.,
Father's Name (in full),
„ Occupation,
„ Place of Birth,
Mother's Name,
„ Place of Birth,
Remarks,

Informant.

FORM C.

No.

HEALTH DEPARTMENT OF THE CITY OF MOBILE.

PHYSICIAN'S CERTIFICATE OF DEATH.

Physicians are reminded of the importance of filling out these certificates promptly and accurately, as without them no interments can be made—and they are the basis of the Mortuary Statistics of the City. Attention is called to the following extract from City Ordinances: . . . . . "He, the Registrar, shall supervise all certificates of death. If they are made out in proper form, he shall give a permit authorising the interment of the body, without which permit no sexton, or other person, shall inter any dead body, under the penalty (not exceeding fifty dollars), provided in Section 49 of the Code of Ordinances. The form of certificate and nomenclature of disease to be prescribed by the Board of Health. If the certificate be in any way defective, it shall be returned to the physician signing the same, for correction; and any physician failing or refusing to give such certificate in proper form, shall be liable to the penalty provided in Section 49, Code of Ordinances."

Mobile, Ala., 189

This Certifies that,
Died on the day of 189
Disease or cause of Death,
Place of Death, Ward,
Street and No.,
Duration of illness,
Place where contracted,
Date of last visit,
Pauper? Yes or no.

M.D.,
Attending Physician.

UNITED STATES—ALABAMA—CITY OF MOBILE—*continued.*

9. No. Coroner must make out certificate.

10. There is no law on the subject. Records show that it is, as may be seen from the following extract from the Annual Report of the Board of Health of the City of Mobile for the year 1891:

TABLE No. 12.

MONTHS OF YEAR 1891.	ALL BIRTHS.									STILLBIRTHS.								
	Physicians.				Midwives.				Total.	Physicians.				Midwives.				Total.
	White.		Coloured.		White.		Coloured.			White.		Coloured.		White.		Coloured.		
	M.	F.	M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.	M.	F.	
January	8	8	—	1	2	9	15	13	56	3	2	2	1	—	—	2	4	14
February	5	3	—	—	7	14	15	20	64	2	—	—	1	—	—	2	2	7
March	12	11	2	—	5	2	13	17	62	2	—	—	2	—	—	7	3	14
April	8	13	—	2	6	4	16	9	58	3	—	2	—	1	—	3	1	10
May	15	9	—	—	2	5	13	16	60	1	1	—	—	—	—	6	2	10
June	10	8	1	1	4	4	20	12	60	—	1	—	1	2	—	—	—	4
July	17	17	1	1	9	5	18	16	84	1	2	—	—	—	—	3	2	8
August	17	16	1	1	3	6	19	19	82	—	1	—	—	—	—	3	2	6
September	7	16	1	2	9	10	22	21	88	1	1	1	—	1	—	2	1	7
October	12	13	3	—	7	5	17	18	75	1	1	2	—	—	—	1	3	8
November	19	11	1	1	5	10	23	14	84	2	2	—	1	—	—	5	1	11
December	12	15	2	2	4	13	18	18	84	2	2	1	2	1	2	1	4	15
Total	142	140	12	11	63	87	209	193	857	18	13	8	8	5	2	35	25	114
Total	282		23		150		402		857	31		16		7		60		114
Total	305				552				857	47				67				114
Total	857								857	114								114

11. No regulations.

12. Not known.

ARIZONA.

Executive Department of Arizona, Office of the Secretary.

Sir, Phœnix, Arizona, June 23 1892.

I have the honour to acknowledge the receipt of your letter of the 20th instant, and to state in reply thereto that no record is required to be kept, by the laws of this Territory, in reference to stillbirths.

(signed) *E. B. Kirkland,*
Private Secretary.

ARKANSAS.

No information furnished.

UNITED STATES—*continued.*

CALIFORNIA.—CITY OF SAN FRANCISCO.

(Answers from Board of Health, San Francisco.)

1. Yes, by City Ordinance :

EXTRACT from Health Laws of San Francisco.

SECTION 3023. The Health Officer must keep a record of all births, deaths and interments occurring in the City and County of San Francisco. Such records when filled, must be deposited in the office of the County Recorder, and produced when required for public inspection.

SECTION 3024. Physicians and midwives must, on or before the fourth day of each month, make a return to the Health Officer of all births, deaths, and the number of stillborn children occurring in their practice during the preceding month. In the absence of such attendants, the parent must make such report within 30 days after the birth of the child. Such returns must be made in accordance with rules adopted, and upon blanks furnished by the Board of Health.

2. Yes.

3. Registered as stillborns.

4. Stillborns.

5. Same as live children.

6. Yes, 369.

7. If known, a felony.

8. Same certificates and same kind of permits as in the case of ordinary live children, as follows :—

FORM A.

No.

CERTIFICATE OF DEATH.

San Francisco, 189 .

This certifies that

Name in full

Aged years months days

Occupation Sex

Place of Birth (State or County)

Previous Residence

Particular Place of Death

Date of Death { If a minor. } Father's Birthplace

Date of Burial { If a minor. } Mother's Birthplace

Place of Interment Cemetery

Single or Married Race

Undertaker.

PHYSICIAN'S CERTIFICATE.

I certify that I have attended the above described decedent from to

189 ; also that the cause of death

was

which was contracted at

M.D.

☞ Please insert the locality, if known, where the disease was contracted.

9. Yes.

10. Yes ; no.

11. Same as physicians.

12. No record kept.

UNITED STATES—*continued.*

COLORADO.

1. Yes. Ostensibly.
2. Yes. By the Health Commissioner.
3. As deaths, because burial permits are issued.
4. Presumably one which has not breathed after birth.
5. Fine of from 3 dollars to 100 dollars. Never enforced.
6. 109 at Denver.
7. Imprisonment not to exceed three years; fine not to exceed 1,000 dollars.
8. *See* Postal Card as follows:—

TO PHYSICIANS AND MIDWIVES.

The City Ordinances require a Report on or before the fifth of each month of your births during the preceding month, and also the immediate report of contagious diseases. Stillbirths should be specified.

Date of Birth 189

Name of father

Occupation of father

Maiden name of mother

Residence No. , Ward

Name of child

Sex colour Nativity

Denver 189 . M.D.

All physicians and midwives must register at the Health Office.

9. Yes.
10. Yes.
11. Practically unregulated.
12. Not known.

COLUMBIA.

No information furnished.

CONNECTICUT.

1. The Statutes make no mention of stillbirths as such, but they provide for the registration of every birth, and it is assumed by the Superintendent of Registration that stillbirths are included. (General Statutes, Revision 1888, Section 103).

2. Registration is made by the official who registers ordinary births and deaths.

3. Always registered as births; but in most towns they are also registered as deaths. They are, however, never counted as deaths in the Annual Registration Report.

4. None given in the Statutes.

5. A fine not exceeding 25 dollars nor less than 10 dollars.

6. Six hundred and forty-nine (649).

7. A fine of not more than 1,000 dollars, or imprisonment in the State Prison for not more than five years, or both.

8. There are no regulations, but the form of certificate has been approved by the Board of Health, and the directions and definitions contained therein are regulations of the Board. The form of certificate used is as follows:—

Answer No. 8—*continued.*

FORM OF RETURN OF A STILLBIRTH.

(*Counterfoil.*)

Child not living when born

Place of birth

Date sex

Name of father

Residence

Occupation

Birthplace

Colour age

Maiden name of mother.

Birthplace

Age colour No. of child

No. now living

Remarks

If illegitimate, so state.

Bureau of Vital Statistics.

STATE OF CONNECTICUT.

RETURN OF A STILLBIRTH.

I certify the following Return to be correct from the best information which I can obtain.

The child was not living when born.

Place of birth, town No. street ward

Date of birth No. of families if tenement house. Sex of child colour

Name of father age colour.

Residence of father, No. street, occupation

Birthplace „ state or country

Maiden name of mother age colour

Birthplace of mother No. of child. No. now living.

Period of utero-gestation—approximately months

Cause of dead birth (if known)

Signature of physician or person making Return.

Dated at this day of 189 .

9. Yes.

10. No, except that they are required to report births, and no obstacle is put in the way of women acting as midwives. The bulk of the midwifery practice is in the hands of properly qualified medical practitioners.

11. None, and no licences are issued to them.

12. Not known.

DAKOTA.

1 to 6. No information furnished.

7. (Territorial law. S. 6538.) Producing abortion: penalty, imprisonment not exceeding three years, or less than one year. Woman concealing birth of child, which if born alive would be a bastard, or death of such child under two years, penalty not exceeding one year, or fine not exceeding 1,000 dollars, or both. For second offence, penalty not exceeding five years' imprisonment, and not less than two years.

8 to 12. No information furnished.

DELAWARE.

1. Compulsory (Volume 16, Chapter 381, Laws of Delaware, Section 9).

2. Registration is made by the official who registers ordinary births and deaths.

3. Separately as stillbirths.

4. Lifeless or dead born.

5. A fine of not less than 1 dollar nor more than 10 dollars, recovered before a justice of the peace of the county where the delinquent resides, one-half going to the person who shall sue and the other to the State.

6. Fifty-nine (59).

7. Not less than 100 dollars, nor more than 5,000 dollars and imprisonment for not more than five years nor less than one year.

8. There are no regulations, but the form of certificate has been approved by the Board of Health, and the directions and definitions contained therein are regulations of the Board. The form of certificate is as follows :—

STATE OF DELAWARE.

CERTIFICATE OF A BIRTH.

In the ____ of ____ New Castle Co.

If stillborn, state the fact.

Full name of child

Sex ____ color

Date of birth

Here give name of street and No., name of town, village or hundred.

Place of birth

Father's name

Age ____ occupation

Nativity

Maiden name of mother

Age of mother

Nativity

Child's number in this family

Child's number by this mother

Name of midwife upon whose information this birth is reported.

I hereby certify (having been present at the birth, or having attended the case of the mother during lying-in period, or, on the information of the midwife above named) that the foregoing statements are true according to the best of my knowledge.

Witness my hand this ____ day of ____ 188

Signature, M.D.

Residence,

To the Recorder of Deeds of New Castle County.

9. Yes.

UNITED STATES—STATE OF DELAWARE—*continued.*

9. Yes.

10. Midwives are recognised by the State, but the bulk of the midwifery practice is not in their hands.

11. Must register name and residence with the recorder of deeds of the county in which they reside, under a penalty of not less than 5 dollars nor more than 10 dollars.

12. Not known.

STATE OF FLORIDA.—CITY OF PENSACOLA.

1. State law.

2. County Board of Health.

3. Both.

4. Born dead.

5. Criminal prosecution.

6. White 6, coloured 27, total 33, for City of Pensacola.

7. Prosecution in Criminal Court.

8. Forms of certificates are as follows :—

Used also in cases of stillbirths.

CERTIFICATE OF DEATH.

PENSACOLA, FLA. 189

Name	Age	years	month	days
Sex	Colour			
Nativity	Occupation			
Married, single or widowed	Residence No.			Street
Cause of death				

I hereby certify that the above described person died as herein stated on the day of 189 M.D.

REMARKS:

Used also in cases of stillbirths.

CERTIFICATE OF DEATH.

Pensacola, Fla., 189

Name			
Race	Sex		
Age	years	months	days.
Place of birth			
Occupation			
Married, single or widowed			
Date of death			
Cause of death			
Place of death			
Time in state			
Birth place of father			
Birth place of mother			
Physician			
Undertaker			
Cemetery			

REMARKS:

9. It is.

10. Not licensed, but practise, and it is mostly in their hands.

11. No regulations.

12. Not known.

STATE OF GEORGIA.

My Dear Sir,— Brunswick, Ga., 21 June 1892.

IN response to your request that I should give you the desired information as to the matters inquired about in the hereto attached circular letter submitted to the British Vice Consul of this city, I beg to submit the following :—

To the first, second, and third questions as to registration of births, stillbirths, and deaths, the law of our state does not make it compulsory upon her citizens to register either births or deaths in the state. Some of the states of the American Union have such a law, but in our state there is no such statute.

In answer to the fourth question as to what is the legal definition of a stillborn child, I submit that a stillborn child is one born or removed from the mother by the aid of artificial means in that condition known as "not quick," inanimate, lifeless, dead.

To the fifth, as to the penalty for neglecting to register a stillbirth, as there is no law in Georgia requiring such registry, of course it follows that there can be no penalty in the doing or not doing of an act that the law says that a citizen must or must not do.

In answer to the seventh inquiry, as to what are the penalties for criminally causing a child to be stillborn, I submit that several statutes have been enacted by our Legislature upon this subject, and in order that you may intelligently understand them, I embrace them all herein. Under Section 4337 (*a*) of the Criminal Law of this state (and made law by the Acts of 1876, page 113), "the wilful killing of an unborn child so far developed as to be ordinarily called "quick" by any injury to the mother of such child, which would be murder if it resulted in the death of such mother, shall be guilty of a felony, and punishable by death or imprisonment for life, as the jury trying the case may recommend." Thus you see by this section of the Code our law is very strict in this regard. The wilful and malicious killing of an unborn child, after it is quickened, in *ventra sa mere*, is murder, and is punished by our law as such.

Again by Section 4337 (*b*) of the Code (same Act of the Legislature above referred to), "Any person who shall administer to any woman pregnant with child any medicine, drug, or substance whatever, or shall use or employ any instrument or other means with intent thereby to destroy such child, unless the same shall have been necessary to preserve the life of such mother, or shall have been advised by two physicians to be necessary for such purpose, shall in case of the death of such child or mother be thereby produced, be declared guilty of an assault with intent to murder." And the punishment in such an event would be imprisonment in the State Penitentiary from one to 20 years at hard labour.

Again, by Section 4337 (*c*) of the Code (same Act as above), "Any person who shall wilfully administer to any pregnant woman any medicine, drug, or substance or anything whatever, or shall employ any instrument or means whatever, with intent thereby to produce the miscarriage or abortion of any such woman, unless the same shall have been necessary to preserve the life of such woman, or shall have been advised by two physicians to be necessary for that purpose, shall, upon conviction, be punished as prescribed in Section 4310 of the Code." This punishment is imprisonment at hard labour in the county chain gang for from one to 12 months ; or a fine of from 1 to 1,000 dollars, either or both, in the discretion of the court.

Again, by Section 4338 of the Code Acts, 1865-66, page 233, "If any woman shall conceal or attempt to conceal the death of any issue of her body, male or female, which, if it were born alive, would by law be a bastard, so that it may not come to light, whether it was murdered or not, every such mother being convicted thereof shall be punished as prescribed in Section 4310 of the Code," punishment being same as above cited.

Again, by Section 4336 of our Criminal Code, "If any person shall counsel, advise, or direct a woman to kill the child she is pregnant or goes with, and after she is delivered of such child, she kill it, every such person so advising or directing shall be deemed an accessory before the fact to such murder, and shall have the same punishment as the principal."

The above covers in substance all our law in relation to killing a child before, at, and after delivery from its mother. The various grades arise from the various causes and inducements to destroy a child before and after birth.

To the sixth question, as to the number of stillborn children interred in 1890, I have no statistics at hand, and cannot give desired information ; also, as to the eighth inquiry, in regard to copy of regulations and form of certificate used in registering stillbirths ; but will say that we have none in Georgia, for the reason stated, that we have no such law requiring this action.

In answer to the 9th, 10th, and 11th questions regarding midwifery, would say that, in this regard as well as the other, the state of Georgia has no statute regulating the practice.

As to the 12th inquiry, as to rate per thousand of women who die in confinement, this I cannot say, not being in possession of necessary statistics.

Yours, &c.
(signed) *Daniel W. Krause,*
Attorney.

Dr. H. Burford, Brunswick, Ga.

UNITED STATES—*continued.*

STATE OF IDAHO.

State of Idaho, Executive Department,
Boise City, June 1892.

Sir,

I HAVE the honour to acknowledge the receipt of your favour of the 23rd inst., referring to the practice of midwifery in Idaho, and questions relating thereto.

There is no law in Idaho concerning the practice of midwifery as distinguished from general medical practice, or relating to stillbirths. This, therefore, disposes of all your questions except Nos. 7 and 12.

To No. 7 I would reply that the crime of causing a child to be stillborn is made a felony by R.S., Section 6794, punishable by imprisonment, not less than two nor more than five years.

To Question 12 I may say there are no statistics of that subject kept by any competent authority.

(signed) *Norman B. Willey,*
Governor.

Denis Donohoe,
Her Britannic Majesty's Consul,
San Francisco, California.

STATE OF ILLINOIS.

1. Yes; State law, as follows:—

Laws relating to Returns of Births Act, 1876–77.

Section 3. [Charge of Registration of Births and Deaths.] The Board of Health shall have supervision of the State system of registration of births and deaths as hereinafter provided; they shall make up such forms and recommend such legislation as shall be deemed necessary for the thorough registration of vital and mortuary statistics throughout the State. The secretary of the board shall be the superintendent of such registration.

Section 4. [Duty of Physicians—Penalty.] It shall be the duty of all physicians and accoucheurs in this State to register their names and post office address with the county clerk of the county where they reside; and said physicians and accoucheurs shall be required, under penalty of 10 dollars, to be recovered in any court of competent jurisdiction in the state, at suit of the county clerk, to report to the county clerk, within 30 days from date of their occurrence, all births and deaths which may come under their supervision, with a certificate of the cause of death, and such correlative facts as the board may require, in the blank forms furnished as hereinafter provided.

Section 5. [Report of Births and Deaths.] Where any birth or death shall take place no physician or accoucheur being in attendance, the same shall be reported to the county clerk within 30 days of date of their occurrence, with the supposed cause of death, by the parent, or, if none, by the nearest of kin not a minor, or, if none, by the resident householder where the death shall occur, under penalty as provided in the preceding section of this Act.

2. Yes.

3. They should be as both. The record of births is kept by the county clerk at Chicago, and of deaths by the Registrar of Vital Statistics. A burial permit is necessary.

4. Ostensibly born dead; in practice, if it does not live 24 hours. If the child lives over 24 hours, the entry is made in the death records.

5. Ten dollars. *See* 1.

6. 1,491 at Chicago, Cook County.

7. Penalty for producing abortion or miscarriage; imprisonment in penitentiary for not less than one or more than 10 years. State Laws, c. 38, s. 3.

8. The forms in use are as follows:—

FORM A.

(Counterfoil)

RETURN OF BIRTH.

1. Name of Child,
2. Sex, Race or colour,
3. Number of Child of this Mother,
4. Date of this Birth,
5. Place of Birth,
6. Residence of Mother,
7. Nationality: Place of Birth: Age of:
   a. Father,
   b. Mother,
8. Full Name of Mother,
9. Maiden Name of Mother,
10. Full Name of Father,
11. Occupation of Father,
12. Name of other Attendants, if any,

Returned by

Dated, 18 .

RETURN OF A BIRTH.

The Physician, Accoucheur, or person in attendance should immediately return this Certificate, accurately filled out, to the County Clerk. Penalty, $10, if not so certified and returned within thirty days.

STATE OF ILLINOIS, }
COOK COUNTY. }

VITAL STATISTICS DEPARTMENT, COUNTY CLERK'S OFFICE.

1. * Full Name of Child (if any),
2. Sex, Race or Colour (if not of the white race),
3. Number of Child of this Mother,
4. Date of this Birth,
5. † Place of Birth, No. Street Ward.
6. Residence of Mother, No. Street Ward.
7. Nationality: Place of Birth: Age of:
   a. Father,
   b. Mother,
8. Full Name of Mother,
9. Maiden Name of Mother,
10. Full Name of Father,
11. Occupation of Father,
12. Name and address of other Attendants, if any,

Returned by } M.D. Midwife.

Dated, 18 . Residence,

* The given name of Child should be certified, if possible, when this certificate is made, and should, in any case, be certified and registered within a year.
† City, number, street, and ward; same in towns that have them; township or precinct.

Answer No. 8—*continued.*

FORM B.

(*Counterfoil.*)	VITAL STATISTICS DEPARTMENT, COUNTY CLERK'S OFFICE.
	RETURN OF A STILL-BIRTH TO COUNTY CLERK.
	The death of an Infant that has breathed must not be returned as a Still-Birth; such deaths should be certified in the usual manner, after returning the Birth record.
Name of Mother,	Name of Mother,
Name of Father,	Name of Father,
Place of Birth,	Place of Birth,
Residence of Mother,	Residence of Mother,
Period of Utero-gestation,	Period of Utero-gestation, Date of this Birth,
Date of Birth,	
Sex, Colour,	Sex, Colour, Nativity of Mother, of Father,
Nativity of Mother,	
Nativity of Father,	
Cause of Dead-Birth (if known),	Cause of Dead-Birth (if known),
Signature of Medical Attendant,	Signature of Medical Attendant,
Residence of Medical Attendant,	Residence of Medical Attendant,
Name of person making this return,	Name of other person making this return,
Residence of person making this return,	Residence of other person making this return,
Date, 18 .	Date, 18
Undertaker,	Undertaker,
Place of Burial,	Place of Burial,

FORM C.

(Counterfoil.)

Name of Mother

Name of Father

Place of Birth

Date of Birth

Sex

Colour

Premature Birth

Stillbirth

Medical Attendant

Residence of Attendant

Date 189

Undertaker

Place of Burial

PREMATURE AND STILLBIRTH RECORD.

HEALTH DEPARTMENT.

Bureau of Vital Statistics.

Chicago 189

Permission is hereby given to remove

the remains of

Date of Death

Place of Death

Premature Birth Stillbirth

Medical Attendant

To for interment.

M.D.,

Registrar of Vital Statistics.

100 dollars fine to remove a body without a permit.

UNITED STATES—STATE OF ILLINOIS—*continued.*

Answer No. 8—*continued.*

FORM D.

HEALTH DEPARTMENT.

TRANSIT PERMIT.

Bureau of Vital Statistics.

Chicago 189

Permission is hereby given to remove the remains of

Date of death Age, years, months, days.

Place of death

Cause of death

which is a disease.

Medical attendant

To for interment.

M.D.,
Registrar of Vital Statistics.

State of Illinois, City of Chicago, Cook County, 189

I hereby certify that the body of named in this transit permit has been prepared by me for transportation in accordance with the rules of the State Board of Health by being

(signed) Undertaker.

If Disease Infectious or Contagious, Undertaker must make following Affidavit.

State of }
County of } On this day of A. D. 189

before me, a in and for the County and State aforesaid, personally appeared to me known and made oath and says that all of the statements contained in the foregoing are true.

Sworn and subscribed to before me this day of A. D. 189

[Seal.]

COUPON No. 2. TO TRANSIT PERMIT. No.

Remains of

Who died at

Delivered at

By

T. B. M.

COUPON No. 1. TO TRANSIT PERMIT. No.

Remains of

Who died at

Taken at

By

T. B. M.

Answer No. 8—*continued.*

FORM E.

To whom it may concern.

HEALTH DEPARTMENT OF THE CITY OF CHICAGO.

Bureau of Vital Statistics.

County of Cook, State of Illinois, United States of America. } ss.

This Certifies, That it appears on the Records of this office, Book

Page No. That on the day

of A.D. 189

aged years months days, native of

Married Single

by occupation a died at

in the Ward in this city; cause of death

duration of disease

was buried in Cemetery, by

undertaker. Medical attendant M.D.

In Witness Whereof, I have hereunto set my hand this

day of 189

M.D

Registrar of Vital Statistics.

State of Illinois, County of Cook, City of Chicago. } ss.

I,

Commissioner of Health of the City of Chicago, do hereby certify that the signature affixed to the foregoing Certificate of Death is the signature of the Registrar of Deaths of the City of Chicago, and that he is the Keeper of the Records.

In Witness Whereof, I have hereunto set my hand and seal of the Department of Health, this day of

189

Seal.

John D. Ware, M.D.,

Commissioner of Health.

9. Yes.

10. Yes; licence on examination; more than half the practice is in their hands.

11. Licence. They are allowed to attend confinements, but if child lives over six hours and shows signs of weakness they must call in a physician as they are not practitioners; otherwise, if child dies, after living 24 hours, they are liable to lose their licence for one year.

12. Not known.

UNITED STATES—*continued.*

STATE OF INDIANA.

1. Yes. The law creating a State Board of Health.

2. Yes.

3. Both.

4. The law does not define it. The Board of Health defines it to be a child that is born dead, after 28 weeks' gestation.

5. For the first offence a fine not exceeding 100 dollars. For the second offence the same fine and imprisonment not exceeding 90 days.

6. Eight hundred and fifty.

7. A fine not exceeding 500 dollars nor less than 50 dollars, and imprisonment in the State Prison not less than three nor more than 14 years.

8. Forms of certificate and quarterly returns are as follows :—

Form 5.

BIRTH RETURN.

1. Name of Child
2. No. of Child of this Mother
3. Sex — 4. Colour
5. Date of Birth
6. Place of Birth
7. Born Alive — 8. Legitimate
9. Mother's Maiden Name
10. Mother's Age
11. Mother's Residence
12. Mother's Birthplace
13. Father's Name
14. Father's Age — 15. Occupation
16. Father's Birthplace
17. Returned by M.D
18. Post Office Address
19. Date of Return 189 .

Answer No. 8—*continued.*

BIRTHS IN COUNTY, QUARTER ENDING 189

(No. 1.) PARENTS. Months.	Number of Births.	Number of Child born to this Mother.												Grouped Ages of Parents.																
		1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th and Over.	N. R.	Under 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		N. R.	
															F'r.	M'r.	F'r.	M'r.	F'r.	M'r.	F'r.	M'r.	F'r.	M'r.	F'r.	M'r.	F'r.	M'r.	F'r.	M'r.
Total - - -																														

(No. 2.) CHILDREN.	Number of Children. *	Total No. of Children.						Nationality of Parents.						Stillbirths.							Plurality Births.							Illegitimate Births.							
		Sex.		Colour.				American.		Foreign.		Not Reported.		No.	Sex of Children.		Nationality of Mother.			Colour of Mother.		No.	Sex of Children.		Nationality of Mother.			Colour of Mother.		No.	Sex of Children.		Nationality of Mother.			Colour of Mother.	
		—		White.		Coloured.																													
		M.	F.	M.	F.	M.	F.	F'r.	M'r.	F'r.	M'r.	F'r.	M'r.		M.	F.	Am.	For.	N. R.	Wh.	Col'd.		M.	F.	Am.	For.	N. R.	Wh.	Col'd.		M.	F.	Am.	For.	N. R.	Wh.	Col'd.
Total - -																																				

* Should include Still, Plurality, and Illegitimate Births.

UNITED STATES—STATE OF INDIANA—*continued.*

9. Yes.

10. Midwives are recognised by the State, but the bulk of the midwifery-practice is not in their hands.

11. Act regulating the practice of medicine. Approved, 11th April 1885.

12. Not known.

STATE OF IOWA.

1. Yes, (State law, Section 2,560).

2. Physicians and midwives must report within 30 days all births and deaths, (Section 2,562).

3 to 4. No information.

5. Ten dollars.

6. No information.

7. (Section 5,163.) Penalty for producing miscarriage, imprisonment not exceeding five years, and fine not exceeding 1,000 dollars; unless to save life of women.

8 to 10. No information.

11. (Section 2,562). All physicians and midwives must register their names with clerk of District Court.

12. No information.

STATE OF KANSAS.

1. Yes. By statutory laws of the State.

2. Yes.

3. As both.

4. Dead at the moment of delivery.

5. Same as an ordinary death; fine or imprisonment at the discretion of the magistrate. Penalty of 500 dollars for neglecting to register a birth; (City Ordinance of Kansas City).

6. Not known.

7. Penalty for abortion.

8. The forms in use are as follows:—

FORM A.

DEATH RETURN.

1. Name of deceased
2. Age
3. Sex
4. Colour
5. Residence
6. Single, married, widow, or widower.
   [Cross out words not required.]
7. Cause of death
8. Occupation
9. Nationality
10. Place of death
11. Duration of disease
12. Complication
13. Duration of complication
14. Date of death
15. Father's name
16. Father's birthplace
17. Mother's maiden name
18. Mother's birthplace
19. Date of return
20. Reported by M.D.
21. Post Office

UNITED STATES—STATE OF KANSAS—*continued.*

Answer No. 8—*continued.*

FORM B.

NOTE.—The undertaker will transmit this Return to the County Health Officer at the end of each month, and apply to him for blanks as required.

No.

STATE OF KANSAS.

THE STATE BOARD OF HEALTH.

Undertaker's Return—Sale of Burial Case.

Name of deceased sex

Age years. Colour Occupation

Date of death 1892. Place Kansas.

Cause of death

Attending physician, Doctor

Post office address Kansas.

Name of undertaker

Place of business Kansas.

Date of sale 1892.

The "No" refers to the number of cases sold within the year, and should be correctly given. If undertaker quits business, transfer blanks to successor, if any; otherwise, return to County Health Officer.

FORM C.

RETURN OF BIRTH.

Kansas City, Missouri.

Date of return 189

Date of birth 189

Sex, male or female; white, coloured. [Cross off the words not required.]

Place of birth street, ward.

Father's name

Father's nativity State County.

Mother's name

Mother's nativity State County.

Born at term? Yes, no. [Cross off the words not required.]

Child living? Yes, no. [Cross off the words not required.]

Medical attendant M.D.

Office of medical attendant

If in a public institution, state name of institution

FORM D.

RETURN OF A STILLBORN INFANT.

To the Board of Health, Kansas City.

Name of mother

Name of father

Residence of mother

Period of Utero-gestation

Date of this birth

Sex race or colour (if not of white race)

Nativity of mother, of father

Cause, &c. M.D.

Name of medical attendant

Residence of medical attendant

Name of person making this return

Residence 189

Date of return

Place of burial 189

Date of burial

Undertaker

Place of business

Answer 8—*continued.*

FORM E.

STATE OF KANSAS. (Form 23.)

DEPARTMENT OF HEALTH.

TRANSPORTATION OF CORPSES.

PHYSICIAN'S CERTIFICATE OF DEATH.

, Kansas, , 188

Name of Deceased,

Date of Death, , 188 Age, yrs., mos., days.

Place of Death,

Cause of Death,

I certify hereby that the above is true to the best of my knowledge and belief.

M. D.

Residence of certifying Physician, , County of Kansas.

UNDERTAKER'S OR SHIPPER'S CERTIFICATE.

, Kansas, , 188

hereby certify that the dead body of

(If minor, give parents' names.)

named in the foregoing Physician's Certificate, has been prepared by for transportation in accordance with the rules of the Kansas State Board of Health.

Undertaker.

Residence of Undertaker.

STATE OF KANSAS.

HEALTH DEPARTMENT.

TRANSPORTATION OF CORPSES.

COUPON TRANSIT PERMIT.

From to

Body of

Died 188 , at

Cause of Death,

M.D.

STATE OF KANSAS.

HEALTH DEPARTMENT.

TRANSPORTATION OF CORPSES.

COUPON TRANSIT PERMIT.

From to

Body of

Died 188 , at

Cause of Death,

M.D.

STATE OF KANSAS.

HEALTH DEPARTMENT.

TRANSPORTATION OF CORPSES.

COUPON TRANSIT PERMIT.

From to

Body of

Died 188 , at

Cause of Death,

M. D.

9. Yes.

10. No.

11. There are no regulations; they are allowed by sufferance to practise.

12. Not known.

STATE OF KENTUCKY.

1. Chapter 72, General Statutes. This law is practically inoperative on account of the state of public and professional sentiment on the entire subject of vital statistics. The State Board of Health has furnished convenient forms for returns to some physicians in the State, with postage prepaid, and with duplicates to be retained by the physician, but the results have been so unsatisfactory as to render the returns practically valueless if not misleading. The board is preparing a Bill for the Revisory Commission, which, if enacted into a law, is hoped to obviate difficulties met in operating present law.

2. Yes, in so far as the law is observed.

3. Births.

4. Any dead-born child after quickening period.

5. The same as for neglecting to register ordinary births; not less than 5 dollars nor more than 20 dollars for each failure to perform the duty.

6. No.

7. There being no statute on the subject the common law prevails. The Highest Court holds that the common law provides no penalty for the act unless it results in the death of the mother. (*See* Mitchell *v.* Commonwealth, 78 Ky. 204.)

8. No separate form used.

9. Yes.

10. Midwives are specially exempted from the provisions of the Medical Practice Act, and with the coloured population, and in the mountain districts the bulk of this practice is in their hands.

11. No regulation on the subject. Any woman may practise midwifery.

12. No available data.

STATE OF LOUISIANA.

[THERE are no laws in the State of Louisiana compelling such registration outside the city of New Orleans, and the answers to the questions propounded are therefore confined to the city of New Orleans.]

1. No burial of a dead body is allowed in any of the cemeteries without permission from the Board of Health, and, therefore, no child stillborn can be buried without having first been reported, and a record of the number of stillbirths occurring is kept in the office of the Louisiana Board of Health.

2. Yes, viz.: The State Board of Health.

3. They are not considered deaths or births, but stillbirths. The laws respecting the registration of births and deaths are as follows:—

"*Revised Laws of Louisiana.—Births and Deaths.*

"Section 338.—It shall be the duty of all the parish recorders of this State to record all births in a book, bound and kept for that purpose in the order of their dates.

"Section 339.—It shall be the duty of the parish recorder to receive declarations of birth within eight days from the birth. They may, however, extend that delay to two months after the birth when a declaration could not be made sooner on account of the persons who are to make the same living at a distance, or being prevented by sickness or other lawful impediment.

"Section

UNITED STATES—STATE OF LOUISIANA—*continued.*

Answer No. 3—*continued.*

"Section 340.—The birth of a child shall be declared by his father, or, in case the father could not make the said declaration, by any other person who may have been present at the birth of the child, and the said birth shall be immediately recorded in presence of the two witnesses.

"Section 341.—The said records shall contain the day, hour, and place of birth, the sex of the child, and the first name or names given to the child, the first name or names, profession, and residence of the father and mother, and the names of the witnesses.

"Section 342.—Deaths shall be recorded by the parish recorders upon the declaration of two witnesses, who shall be, if possible, the two nearest relatives or neighbours of the deceased, or, when a person shall have died out of his house, the person at whose house he shall have died, with a relation or another.

"Section 343.—The record of deaths shall contain the name in full, age, trade, and residence of the deceased; the name in full of the surviving consort, if the person deceased was married, or widower, or widow; the name, age, profession, and residence of the declarants, and, if they be relatives, their degree of relationship. The same record shall contain, as far as the same may be ascertained, the Christian names, profession, and residence of the father and mother of the deceased, and the place of his or her birth.

"Section 344.—No person out of the parish of Orleans shall be under any legal obligation to have a birth or death recorded.

"Section 345.—The birth of every child in the parish of Orleans shall be declared therein within 30 days, as provided in the preceding sections. Every person offending against the provisions of this section shall pay a fine of not less than 5 dollars nor more than 10 dollars, one half for the benefit of the informer.

"Section 346.—For the parish of Orleans there shall be an office of record of births and deaths, whereof the officer shall be appointed by the Governor.

"Section 347.—The death of every person within the parish of Orleans shall be reported at said office within 24 hours thereafter. This declaration shall be made by the nearest relative of the deceased, if he or she is present, and, in case of absence, by the testamentary executor, if there be one; if none, by the owner or tenant of the house in which the person died; and if the death happened in a State, parish, municipal, charitable, or benevolent institution, hospital, asylum, prison, workhouse, house of refuge, insane asylum, &c., it shall be the duty of the president, superintendent, or managers of said institutions to have the said death recorded in the said office of recorder of births and deaths monthly. It shall also be the duty of the coroners to record monthly in said office the deaths of all persons upon whose bodies an inquest has been held, or a certificate issued by them for the burial of indigent persons; and the recording fees in such cases shall be charged to the city of New Orleans, or the police jury of the parish of Orleans, right bank, as the case may be; and any person contravening the provisions of this section shall be fined not less than 10 dollars nor more than 25 dollars, recoverable before any court of competent jurisdiction.

"Section 348.—For every record of birth and death, and for registering the same, henceforward the sum of 50 cents shall be allowed."

On this subject the President of the State Board of Health, who is Recorder of Births and Deaths, states in his Annual Report to the General Assembly of the State of Louisiana for 1891:

"We can only admit with shame that Louisiana is far behind in the matter of collection of these statistics. Births, marriages, and deaths are very imperfectly, if at all, recorded in most sections of Louisiana. Even in New Orleans the record of births is extremely imperfect, and almost valueless for statistical study. These records are infinitely worse in the country. Marriages and deaths are, with few exceptions, carefully recorded in our city, but in the country the careful record is, I believe, the exception. As to deaths, the rule in the country is to bury without a certificate. Of such deaths the only record would be found in the private notes of the attending physician. This is a well-known fact. Now, this is all clearly wrong. This Board should have authority to collect these certificates from all parts of the State. County boards or police juries should be required to keep records of vital statistics, and forward at stated periods certified copies of these records to the main office, which should be the registration office for the whole State. The remarks which I am about to make are, unfortunately, based upon the statistics for the city of New Orleans alone. There are practically no available data from any other locality."

4. A child that never breathed.

5. None.

6. Four hundred and ninety.

7. Penitentiary service.

8. None.

9. Yes; provided she be a recognised midwife under the law, viz., that she has registered as such.

10. Yes.

11. There is no law regulating midwifery.

12. Not known.

STATE OF MAINE.

1. Compulsory under Chapter 118 of Laws for 1891.

2. Yes.

3. As births and deaths.

4. The laws supply no definition.

5. Fine not exceeding 100 dollars.

6. Not known.

7. For procuring miscarriage, imprisonment for not more than five years, or fine not exceeding 1,000 dollars.

8. No regulations. Forms of physician's certificate of birth, and of town clerk's certificate of registration, are as follows :—

FORM A.

STATE OF MAINE.

CERTIFICATE OF BIRTH.

Date and place of Birth

Name of child *Sex Colour

Living or stillborn No. of child, 1st, 2nd, &c.

Names of Parents† }

Colour Residence

Occupation

Birthplace of father Age

Birthplace of mother Age

Maine

M.D.

189 .

*Use initial for sex, colour, &c.
†Give maiden name of mother.

UNITED STATES—STATE OF MAINE—*continued.*

Answer No. 8—*continued.*

FORM B.

TOWN CLERK'S BLANK.

Births Registered in the _____ of _____ for the year ending 31st December 189 .

Date of Birth.	Place of Birth.	Name of the Child (if any).	Male or Female.*	Living or Still-born.	No. of Child, 1st, 2nd, &c.	Colour.	Name of Father.	Maiden Name of Mother.	Colour of Parents.	Residence of Parents.	Occupation of Father.	Birthplace of Father.	Birthplace of Mother.	Reported by

I hereby certify that the above return is correct, according to the best of my knowledge and belief.

Town Clerk.

* Use M. or F. as an abbreviation.

UNITED STATES—STATE OF MAINE—*continued.*

9. Yes.

10. Not professionally. No statistics.

11. No regulations.

12. Not known.

STATE OF MARYLAND.

1. There is no statute law requiring the registration of births or deaths in this State.

2. *See* preceding answer.

3. *See* Answer No. 1.

4. A child born dead during any period of pregnancy.

5. No penalty fixed by statute law.

6. No record.

7. With criminal intent, "imprisonment in the penitentiary for not less than three years, or by a fine not less than 1,000 dollars or more than 5,000 dollars, or both, in the discretion of the court."

8. None used.

9. *See* answer to No. 1.

When criminal interference is suspected the burial is under the direction of the coroner.

10. A statute law regulating the practice of medicine in the State provides that "all persons commencing the practice of medicine in any of its branches shall secure a certificate from an examining board." Section 51 of the same Act provides that the said Act "shall not apply to any midwife."

11. *See* preceding answer.

12. There is no record.

STATE OF MASSACHUSETTS.

1. Not compulsory. No mention of stillbirths in the Statutes.

2. Yes.

3. As deaths.

4. The laws supply no definition.

5. No penalty.

6. Two thousand and ninety-nine in 1890.

7. For giving information or advice as to means of procuring miscarriage, imprisonment not exceeding three years, or fine not exceeding 1,000 dollars; and for employing such means, imprisonment from one to five years, and fine not exceeding 2,000 dollars.

8. No regulations. Form of physician's certificate required for purpose of burial is as follows :—

PHYSICIAN'S CERTIFICATE OF THE CAUSE OF DEATH.

Boston, 189 .

Name and age of deceased ... Age, ... years ... months ... days.

Date and place of Death

Disease or cause of Death

Duration of disease*

I certify that the above is true, to the best of my knowledge and belief.

Name and residence of physician M.D

* It is very desirable to be informed of the duration of the disease.

The office of the Board of Health will be open for the granting of permits for burial as follows :— Saturdays, 9 a.m. till 2 p.m. ; Sundays, 10 a.m. till 12 m. ; holidays, from 10 a.m. till 12 m. ; other days, from 9 a.m. till 5 p.m.

9. Yes.

10. Not professionally. No statistics as to relative number employed.

11. No regulations.

12. In 1890 the rate of deaths in, or directly consequent on, confinement was 4·6 per 1,000 of women confined.

STATE OF MICHIGAN.

1. No. None.

2. Yes.

3. Both.

4. Born dead, never having breathed.

5. None, except local ordinance relative to deaths.

6. One thousand three hundred and ninety-seven. Total births for year, 52,306.

7. Imprisonment for certain terms.

8. None, but for usual births and deaths.

9. Yes.

10. Midwives are recognised by the State, but the bulk of the midwifery practice is not in their hands.

11. Must register.

12. One hundred and eighty-five deaths recorded as "child-birth" in 1890.

STATE OF MINNESOTA.

1. Yes; stillbirths being recorded as deaths.

Chapter 114, *General Laws of* 1887. *An Act to provide for the Collection of Vital Statistics.*

Section 1.—The clerk of each town, and the health officer of each village, borough or city in this State, shall obtain and register the following facts concerning the births and deaths occurring therein, separately numbering and recording the same in the order in which he obtains them, designated in separate columns, viz.: In the registry of births, the date of birth, the name of the child (if it have any), the sex and colour of the child, the names and places of birth of the parents, and the date of the record; in the registry of deaths, the date of death [the name of the deceased], the sex and colour, the condition, whether single, widowed or married [the age, place of birth], the names and places of birth of the parents, the disease or cause of death, and the date of the record. The county auditor of each county shall furnish each clerk or health officer within his county, at the expense of the county, a book in which to register the facts concerning the births and deaths as above provided. Provided, however, that in cities of over 100,000 inhabitants, where the duties hereby imposed upon the health officer, have heretofore been imposed upon the city clerk, the latter shall continue to perform the same and receive the compensation therefore.

Section 2.—Parents shall give notice to each clerk or health officer, of the births and deaths of their children; every householder shall give like notice of every birth and death happening in his house; the oldest person, next of kin, shall give such notice of the death of his kindred; the keeper, or other proper officer, of every work-house, poorhouse, reform school, jail, prison, hospital, asylum, or other public or charitable institution, shall give like notice of any birth or death happening among the persons under his charge. Whoever neglects or refuses to give such notice for the period of ten (10) days after the occurrence of a birth or death, shall forfeit a sum not exceeding twenty (20) dollars, to be collected as other fines are collected by law.

2. Yes. *See* 1.

3. Stillbirths are registered as deaths only.

4. No legal definition. Definition accepted, "Born dead."

5. Same as neglecting to report any death.

Chapter 114, *General Laws of* 1887. *An Act to provide for the Collection of Vital Statistics.*

Section 3.—Any physician having attended a person during his last illness shall, within ten (10) days after the decease of such person, furnish for registration to such clerk or health officer a certificate of the duration of the last illness, the name of the deceased, his age, the disease of which the person died, and the date of his decease. And any physician or midwife having attended a case of confinement shall, within ten (10) days thereafter, furnish for registration to said clerk or health officer a certificate of the date of birth, sex, and colour of the child, with the names, dates, and places of birth of the parents. If any physician or midwife neglects to make such certificate, he shall forfeit the sum of twenty-five (25) dollars, to be collected as other fines are collected by law.

6. The register of each month is kept. The total for the 12 months of 1890 was 176, at St. Paul.

7. Extract from Penal Code :—

Section 161.—"The wilful killing of an unborn quickchild, by any injury committed upon the person of the mother of such child, is manslaughter in the first degree."

Section 254.—"A person who endeavours to conceal the birth of a child by any disposition of the dead body of the child, whether the child died before or after its birth, is guilty of misdemeanour."

8. Same as used in registering any death, as follows :—

FORM A.

Form I.—Vital Statistics. State Board of Health of Minnesota.

Clerks and health officers will insist that the blanks of this form are all filled, or return them for correction. If for any reason one or more cannot be filled, insist that the reason be stated on the report.

REPORT OF A BIRTH.

This form must be filled and sent to the clerk of township, or health officer of villages or cities (for exception in cities of over 100,000 inhabitants, *see* Section 1 of the Law), for every birth, within ten days of its occurrence, under penalty of not more than twenty (20) dollars. This notice must be given by parents of their children, by householders of births in their houses ; the keeper or other proper officer of every workhouse, poorhouse, reform school, jail, prison, hospital, asylum, or other public or charitable institution, shall give like notice of any birth among the persons under his charge. (Section 2.) Any physician or midwife having attended a case of confinement shall, within ten days, make this return, as above, under penalty of twenty-five (25) dollars. (Section 3.) Chapter 114, Laws of 1887. (Chapter 96, newspaper supplement.)

Place and date of Birth		
Name of child	Sex	Colour
Father's name	Where born	
Mother's name	Where born	
Father's age	Mother's age	
Date of this return		
Signature of person making this return		

UNITED STATES—STATE OF MINNESOTA—*continued.*

Answer No. 8—*continued.*

FORM B.

Vital Statistics.—Form III. State Board of Health of Minnesota

RETURN of BIRTHS in the of , County of and State of Minnesota.

This return to be made to the Secretary of State Board of Health and Vital Statistics on or before the 12th of the month succeeding that to which it relates. All the spaces must be filled, or the reason for not so doing given in letter accompanying report.

No.	DATE OF BIRTH. Month.	DATE OF BIRTH. Day.	Christian Name (if any) of Child and Surname of Father.	Sex and Condition, as Twins, Illegitimate, &c.	Colour.	FULL CHRISTIAN NAME OF EACH PARENT. Father.	FULL CHRISTIAN NAME OF EACH PARENT. Mother.	BIRTHPLACE OF EACH PARENT. Father.	BIRTHPLACE OF EACH PARENT. Mother.	AGE OF Father.	AGE OF Mother.	When Registered.

I hereby certify that the above is a correct return of all Births which occurred in this , for the month of , A.D. 189 , according to the best of my knowledge and belief.

Dated (give P. O. address) , 189 .

Clerk or Health Officer.

FORM C.

Form II.—Vital Statistics. State Board of Health of Minnesota.

Clerks and health officers will insist that the blanks of this form are all filled, or return them for correction. If for any reason one or more cannot be filled, insist that the reason be stated on the report.

REPORT OF A DEATH.

This form to be filled and returned to the clerk of township, and the health officer of village or cities (*see* exception for cities of over 100,000 inhabitants, Section 1 of Law), within ten days after the death to which it relates, under penalty of not more than twenty (20) dollars, by parents of their children, by every householder of every death occurring in his household, by the oldest person next of kin of the death of his kindred, by the keeper, or other proper officer, of every workhouse, poor-house, reform school, jail, prison, hospital, asylum, or other public or charitable institution, of any deaths occurring among persons under his charge. (Section 2.) Any physician having attended a person during his last illness shall, within ten (10) days, furnish this certificate to the clerk or health officer, as the case may be, under penalty of twenty-five (25) dollars. (Section 3.) Chapter 114, Laws of 1887. (Chapter 96, newspaper supplement.)

Place and date of Death

Name of deceased Occupation

Place of Birth Age years months days.

Sex Colour Condition (single, married, or widowed)

Father's name Where born

Mother's name Where born

Disease or cause of Death

Name and address of attending physician

Date of this return

Signature of person making this return

Answer No. 8—*continued.* FORM D.

Vital Statistics.—Form IV. State Board of Health of Minnesota.

RETURN of DEATHS in the of , County of , and State of Minnesota.

This return to be made to the Secretary of State Board of Health and Vital Statistics on or before the 12th of the month succeeding that to which it relates. ALL THE SPACES MUST BE FILLED, or the reason for not so doing given in letter accompanying report.

No.	Date of Death.		FULL NAME OF DECEASED.	Sex.	Colour.	Single, Married, or Widowed.	AGE.			PLACE OF BIRTH.	Disease or Cause of Death.	OCCUPATION.	FULL NAMES OF PARENTS.		BIRTHPLACE OF PARENTS.		Name and Address of attending Physician.	When Registered.
	Month.	Day.					Years.	Mos.	Days.				Father.	Mother.	Father.	Mother.		

I hereby certify that the above is a correct return of all Deaths which occurred in this , for the month of , A.D. 188 , according to the best of my knowledge and belief.

Dated (give P. O. address), 188 .

Clerk or Health Officer.

9. Yes.

10. Yes.

11. They are examined by the State Board of Medical Examiners.

Chapter 30—*Laws of* 1891.

An Act to regulate the Practice of Midwifery in the State of Minnesota.

Be it enacted by the Legislature of the State of Minnesota:—

Section 1.—That every person practising midwifery in any of its branches shall possess the qualifications required by this Act. Every person hereafter beginning the practice of midwifery in this State, if a graduate in midwifery, shall present his or her diploma to the State Medical Examining Board for verification of its genuineness. If the diploma is found to be genuine, and the person named therein be the person claiming and presenting the same, the board, on payment of a fee of one dollar ($1.00), shall issue a license to that effect signed by the president and secretary of said board, and bearing the seal of said board, and such license shall be conclusive as to the right of the person named therein to practise midwifery in this State for the period of one year. If not a graduate, such person shall appear before the board and submit to such examination in midwifery as the board shall require; and if the said examination be satisfactory to the examiners, the said board shall issue its license in accordance therewith, on payment of a fee of two dollars ($2.00), and the person named therein shall be entitled to all the privileges and rights hereinafter mentioned for the period of one year.

Section 2.—All persons heretofore practising midwifery in any of its branches in the State of Minnesota shall register their names with the secretary of the State Medical Examining Board, with an affidavit duly executed before a notary public, or with a written certificate from some legally authorised practitioner of medicine, setting forth the time and places in which such a person has been engaged in the practice of midwifery in the State of Minnesota; and upon the filing of such certificate and the payment of a fee of one dollar ($1.00) to the secretary of said board, the board shall issue to such person a license signed by the president and secretary of said board, and bearing the seal of said board, which license shall entitle the person named therein to all rights and privileges hereinafter mentioned for the period of one year.

Section 3.—Every person so licensed shall each year subsequently register his or her name with the secretary of said board, and shall pay to the secretary of said board a fee of one dollar ($1.00), and the secretary shall issue a license to such person in accordance therewith.

Section 4.—The State Board of Medical Examiners are hereby authorised and empowered to execute the provisions of this Act, and shall hold examinations of candidates for licenses in midwifery at the Capitol on the first Tuesdays of January, April, July, and October, and at such other times and places as may be deemed expedient.

Section 5.—The State Board of Medical Examiners may refuse licenses to persons guilty of unprofessional or dishonourable conduct, and may revoke licenses for like causes, or for neglect to make proper returns to the various health officers of births, deaths, and cases of puerperal fever and other contagious diseases occurring in their practice.

Section 6.—Any person shall be regarded as practising midwifery within the meaning of this Act who shall publicly profess to be a midwife or who shall for a fee attend to women in childbirth, but nothing in this Act shall be construed to prohibit students of medicine or midwifery practising under the direct supervision of a preceptor, or to prohibit gratuitous services in cases of emergency. This Act shall not apply to physicians and surgeons duly authorised by the State Board of Medical Examiners, or to commissioned surgeons of the United States Army or Navy.

Section 7.—Any person practising midwifery in this State without first complying with the provisions of this Act shall be punished by a fine of not less than ten dollars ($10.00) nor more than fifty dollars ($50.00), or by imprisonment in the county jail for a period of not less than ten (10) nor more than thirty (30) days.

Section 8.—All Acts or parts of Acts inconsistent herewith are hereby repealed. This Act shall take effect from and after its passage.

Approved, 20 April 1891.

12. Not known.

STATE OF MISSISSIPPI.

No information furnished.

UNITED STATES—*continued.*

STATE OF MISSOURI.

1. Yes. The State of Missouri has established a State Board of Health, which is required to report annually to the Governor, but on account of the lack of proper penalties for neglecting to report "vital statistics," and also a lack of appropriations to pay for the necessary registers, blanks, and fees to county clerks for registration, the returns are meagre, and therefore not collected and published by the Board. The registration at St. Louis is regulated by City Ordinances more particularly.

2. Yes.

3. As both, but are not counted in making up the comparative mortality tables.

4. No legal definition.

5. As for the offence of misdemeanour, from 10 dollars to 200 dollars fine; at Kansas City, under 50 dollars.

6. 710 at St. Louis.

7. As for manslaughter, incarceration in the penitentiary for such period as the court or jury may assess.

8. The form in use is as follows:—

☞ If the Child is born alive, this Certificate cannot be used.

Midwives are reminded of the importance of filling out these Certificates with accuracy. They are the basis of the Mortuary Statistics of the City.

No.

BURIAL CERTIFICATE.

ST. LOUIS.

This Certificate must be fully and accurately filled out in ink, as provided by Sect. 385, Art. 9, Chap. Revised Ordinances of 1887.

Child of

Term of gestation months.

Nativity of father Sex and colour of Stillborn.

Nativity of mother Male. Female. White. Coloured. } Cross out the words not required.

Place of Birth Street

Exact locality of Birth. { Block, bounded } North by St. East by St. West by St. South by St.

City Ward No.

Date of Confinement

Cause of Stillbirth

I Certify that I attended the mother in this her last confinement, on the date above named, and that the child was Stillborn.

Midwife.

Address

Place of burial

Undertaker.

Office: HEALTH DEPARTMENT.

St. Louis, Mo., 189

I Certify that I have examined this Certificate, and find it to accord with the requirements of the City Ordinance and Charter.

Health Commissioner.

Clerk of Health Commissioner and Board of Health.

☞ Sextons receiving Burial Certificates without the signature of the Commissioner or his Clerk will subject themselves to a fine, as provided by Revised Ordinances of 1887.

9. Yes.

UNITED STATES—STATE OF MISSOURI—*continued.*

9. Yes.

10. Yes. Midwifery is considered a department of medicine. The bulk of the practice is in their hands at St Louis, but not at Kansas City.

11—

(Revised Statutes 1889.)

MEDICINE AND SURGERY.

Chapter 110.—Article I.

Section.
6871. Practitioners of medicine, qualifications of.
6872. Board of Health shall issue certificates, when.
6873. Verification of diplomas.
6874. Examinations made by Board.
6875. Certificates to be recorded with county clerk.
6876. Clerk to keep list of certificates, &c.
6877. Examinations made in writing.
6878. Certificates, when revoked.
6879. Who regarded as practicing medicine.
6880. Itinerant vendors of drugs, etc., to pay license—penalty.
6881. Penalty for violating provisions of this article.
6882. Who to perform duties of county clerk in St. Louis City.

Section 6871. *Practitioners of medicine, qualifications of*—Every person practicing medicine and surgery, in any of their departments, shall possess the qualifications required by this article. If a graduate of medicine, he shall present his diploma to the State Board of Health for verification as to its genuineness. If the diploma is found to be genuine, and if the person named therein be the person claiming and presenting the same, the State Board of Health shall issue its certificate to that effect, signed by at least four of the members thereof, and such diploma and certificate shall be deemed conclusive as to the right of the lawful holder of the same to practice medicine in this State. If not a graduate, the person practicing medicine in this State shall present himself before said board, and submit himself to such examination as the said board shall require, and if the examination be satisfactory to the examiners, the said board shall issue its certificate in accordance with the facts, and the lawful holder of such certificate shall be entitled to all the rights and privileges herein mentioned. (Laws 1883, p. 115.)

Section 6872. *Board of Health to issue certificates, when.*—The State Board of Health shall issue certificates to all who shall furnish satisfactory proof of having received diplomas or licenses from legally chartered medical institutions in good standing, of whatever school or system of medicine. They shall prepare two forms of certificates, one for persons in possession of diplomas or licenses, the other for candidates examined by the board. They shall furnish to the county clerks of the several counties a list of all persons receiving certificates: provided, that nothing in this article shall authorise the Board of Health to make any discrimination against the holders of genuine licenses or diplomas under any school or system of medicine. (Laws 1883, p. 115.)

Section 6873. *Verification of diplomas.*—Said State Board of Health shall examine diplomas as to their genuineness, and if the diplomas shall be found genuine, as represented, the secretary of the State Board of Health shall receive a fee of one dollar from each graduate or licentiate, and no further charge shall be made to such applicant; but it it be found to be fraudulent, or not lawfully owned by the possessor, the Board shall be entitled to charge and collect twenty dollars of the applicant presenting such diploma. The verification of the diploma shall consist in the affidavit of the holder and applicant, that he is the lawful possessor of the same, and that he is the person therein named; such affidavit may be taken before any person authorised to administer oaths, and the same shall be attested under the hand and official seal of such officer, if he have a seal. Graduates may present their diplomas and affidavits as provided in this article, by letter or by proxy, and the State Board of Health shall issue a certificate as though the owner of the diploma were present. (Laws 1883, p. 115—*a*.)

Section 6874. *Examinations made by Board.*—All examinations of persons not graduates or licentiates shall be made directly by the Board, and the certificates given by the Board shall authorise the possessor to practice medicine and surgery in the State of Missouri. (Laws 1883, p. 115.)

Section 6875.

(*a*) An applicant for a certificate to practice medicine and surgery, must give satisfactory proof to Board of Health of having received his diploma from a legally chartered medical institution in good standing. 83 Mo. 123.

UNITED STATES—STATE OF MISSOURI—*continued.*

Answer No. 11—(Revised Statutes, 1889)—*continued.*

Section 6875. *Certificates to be recorded with county clerk.*—Every person holding a certificate from the State Board of Health shall have it recorded in the office of the county clerk of the county in which he resides, and the record shall be indorsed thereon. Any person removing to another county to practice medicine and surgery, shall procure an indorsement to that effect on the certificate from the clerk of the county court, and shall have the certificate recorded in the office of the clerk of the county to which he removes, and the holder of the certificate shall pay to said clerk of said county the usual fees for making the record. (Laws 1883, p. 115.)

Section 6876. *Clerk to keep list of certificates, &c.*—The county clerk shall keep, in a book provided for the purpose, a complete list of the certificates recorded by him, with the date of the issue. If the certificate be based on a diploma or license, he shall record the name of the medical institution conferring it, and the date when conferred. The register of the county clerk shall be open to public inspection during business hours. (Laws 1883, p. 115.)

Section 6877. *Examination made in writing.*—Examinations may be made in whole, or in part, in writing, and shall be of an elementary and practical character, but sufficiently strict to test the qualifications of the candidate as a practitioner. (Laws 1883, p. 115.)

Section 6878. *Certificates, when revoked.*—The State Board of Health may refuse certificates to individuals guilty of unprofessional or dishonourable conduct, and they may revoke certificates for like causes after giving the accused an opportunity to be heard in his defence before the Board. (Laws 1883, p. 115.)

Section 6879. *Who regarded as practicing medicine.*—Any person shall be regarded as practicing medicine within the meaning of this article, who shall profess, publicly, to be a physician, and to prescribe for the sick, or who shall append to his name the letters "M.D."; but nothing in this article shall be construed to prohibit students from prescribing under the supervision of a preceptor, or to prohibit gratuitous services in cases of emergency; and this article shall not apply to commissioned surgeons of the United States army, navy, and marine hospital service. (Laws 1883, p. 115.)

Section 6880. *Itinerant vendors of drugs, &c., to pay license, penalty.*—Any itinerant vendor of any drug, nostrum, ointment, or appliance of any kind, intended for the treatment of disease or injury, or who shall, by writing or printing, or any other method, publicly profess to cure or treat diseases, injuries or deformities by any drug, nostrum, manipulation or other expedient, shall pay to the State a license of one hundred dollars per month, to be collected as provided for by law, as all other licenses are now collected; and any person violating the provisions of this section shall be deemed guilty of a misdemeanour, and upon conviction thereof, shall be punished by a fine not to exceed five hundred dollars, or by imprisonment in the county jail, not to exceed six months, or by both such fine and imprisonment. (Laws 1883, p. 115.)

Section 6881. *Penalty for violating provisions of this article.*—Any person practicing medicine or surgery in this State without complying with the provisions of this article, shall be deemed guilty of a misdemeanour, and be punished by a fine of not less than fifty dollars nor more than five hundred dollars, or by imprisonment in the county jail for a period of not less than thirty days nor more than three hundred and sixty-five days, or by both such fine and imprisonment, for each and every offence; and any person filing or attempting to file as his own the diploma or certificate of another, or a forged affidavit or identification, shall be guilty of a felony, and upon conviction thereof, shall be subject to such fine and imprisonment as are made and provided by the Statutes of this State for the crime of forgery in the second degree, but the penalties shall not be enforced until a period of six months after the passage of this law; provided, that the provisions of this article shall not apply to those persons who have been practicing medicine five years in this State. (Laws 1883, p. 115.)

Section 6882. *Who to perform duties of county clerk in St. Louis City.*—Whenever in this article it is provided that any duty or service shall be performed by any county clerk, such duty and service in the City of St. Louis shall be performed by the city register or health commissioner of the City of St. Louis, as if such officer was specially named to perform these duties and services. (Laws 1883, p. 115.)

CITY ORDINANCES, ST. LOUIS.

ARTICLE 15.

Regulations concerning the Practice of Medicine and Surgery and Midwifery.

Section 489. It shall hereafter be unlawful for any person to practice medicine or surgery in the City of St. Louis, who shall not first have received the degree of Doctor

UNITED STATES—STATE OF MISSOURI—*continued.*

Answer No. 11—CITY ORDINANCES, ST. LOUIS—*continued.*

Doctor of Medicine from some medical college or university duly established under and by virtue of the laws of the State or country in which the same is situated; provided, however, that this section shall not apply to any person who may now be authorised to practice medicine or surgery by virtue of existing laws of the State in relation thereto.

Section 490. Every person who shall hereafter engage in the practice of medicine or surgery in the City of St. Louis, shall, before entering upon such practice, file a copy of his or her diploma in the office of the Health Commissioner, which shall by subscribed and sworn to by the person filing the same, and thereupon the Health Commissioner or his clerk shall enter the name of such person, the date of filing the said copy, the date of his or her diploma, and the name and location of the school or university granting such diploma, in a book to be kept by the Health Commissioner for that purpose, and shall require the person filing such copy to subscribe his or her name in said book.

Section 491. Every person now practising medicine or surgery in this city, or who shall commence the practice of medicine or surgery in this city before the passage of this article, shall register his or her name in the book described in the preceding section in the office of the Health Commissioner, and shall exhibit his or her diploma to the Health Commissioner for inspection at the time of such registration, but shall not be required to file any copy of the same, and thereupon the Health Commissioner shall enter in said book all the facts as required in the preceding section.

Section 492. Whenever the Health Commissioner has reason to believe that the diploma shown, or claimed to be in the possession of the person presenting the same, or the copy thereof, has been purchased, or has not been issued to the person presenting the same, or that the medical school or university purporting to have issued the same is not a medical school or university in good standing, he shall refuse to allow the person presenting the diploma, or the copy thereof to register, but shall forthwith refer the matter, with all the facts in the case, to the Board of Health, who, after hearing, shall decide whether said person shall be allowed to register; and if the Board of Health shall so decide, it shall direct the Health Commissioner to allow said person to register, but if in the opinion of the Board of Health said person should not be allowed to register, the Health Commissioner shall not permit said person to register.

Section 493. Every person who shall practice, or attempt to practice, medicine or surgery in this city without first having complied with the provisions of this article, shall be deemed guilty of a misdemeanor, and upon conviction shall be fined not less than 25 dollars nor more than 500 dollars.

Section 494. It shall not be lawful for the Health Commissioner or his clerk to sign any burial certificate signed by any other than a registered physician.

Section 495. If any overseer, sexton, or other person having control of a graveyard, shall permit any person to be interred in said graveyard without a certificate signed by a registered physician, and countersigned by the Health Commissioner or his clerk, he shall be deemed guilty of a misdemeanor, and upon conviction shall be fined not less than 25 dollars nor more than 500 dollars, to be recovered as in other cases of misdemeanor, before any court or officer having competent jurisdiction.

Section 496. Hereafter it shall not be lawful for any person to practice midwifery, unless such person shall first register her name and place of abode in a book in the office of the Health Commissioner, kept for that purpose; but no person shall be allowed to register as a midwife who shall not first either file a diploma from some school of midwifery in good standing, or a certificate signed by at least two registered physicians, which certificate shall state that the party named in the certificate is, in their opinion, qualified to practice midwifery, and any person who shall practice, or attempt to practice midwifery, without first having complied with the provisions of this article, shall be deemed guilty of a misdemeanor, and upon conviction shall be fined not less than 25 dollars nor more than 50 dollars.

Section 497. Nothing in this article shall be so construed as to permit any druggist to engage in practice of medicine or surgery, without having first filed with the Health Commissioner a diploma, or certified copy thereof, in accordance with the provisions of the first three sections of this article.

ARTICLE 18.

Of Vital Statistics.

Section 526. The Health Commissioner shall provide for the registration of all births and deaths occurring within the city of St. Louis, and for that purpose it

UNITED STATES—STATE OF MISSOURI—*continued.*

Answer No. 11—CITY ORDINANCES, ST. LOUIS—*continued.*

shall be the duty of every physician and midwife to report weekly to the Health Commissioner, at or before the hour of four o'clock in the afternoon of Saturday of each and every week in accordance with printed forms to be furnished by said Health Commissioner, a statement of the sex and date of birth of every child born in this city where they have attended the birth of such child; and in case no physician or midwife attended the birth of any child born in this city, then, and in that case, it is hereby made the duty of the father or mother to make such report to the Health Commissioner.

Section 527. All persons authorised by law to solemnise marriages shall report every marriage solemnised by them within the limits of the city of St. Louis to the Recorder of Deeds within 90 days from the time said marriage has been solemnised.

Section 528. It shall be the duty of every physician and person engaged in the practice of medicine in the city of St. Louis to report to the Health Commissioner the death of any person under their care and treatment, when the person died, and with such particulars as the Health Commissioner may prescribe; and it shall also be the duty of the coroner of the city of St. Louis to make a weekly report to the Health Commissioner of all inquests and all deaths within the city of St. Louis coming within his official knowledge.

Section 529. Every person whose duty it is to make any of the reports prescribed by this article shall make the same within the time as prescribed, and any person who shall fail to make such report or to comply with any of the provisions of this article shall be deemed guilty of a misdemeanour, and upon conviction thereof shall be fined not less than 10 nor more than 100 dollars, to be recovered as in other cases of misdemeanour before any court having competent jurisdiction.

Section 530. The Health Commissioner shall keep a record of all births and deaths on file in his office.

ARTICLE 12.

Midwives and Dentists.

Section 1481. It shall not be lawful for any person to carry on the business or practice the profession of a midwife or dentist within the city of St. Louis without first obtaining a license therefor from the collector.

Section 1482. A midwife or dentist is a person who performs surgical operations, or attends women in childbirth, or who advertises himself or herself either in the public prints or by hanging out a sign to cure bodily diseases or ailments generally or specially, or who practises the profession of midwife.

Section 1483. There shall be levied and collected by the collector on every license granted to a midwife the sum of five dollars, and for a dentist the sum of ten dollars, the payment of which amount will entitle the holder of said license to carry on the business of a midwife or dentist for the term of one year, and no license shall be issued for a less period than one year.

Section 1484. Any person carrying on the business or practicing the profession of midwife or dentist in the city of St. Louis, without first procuring a license therefor from the collector, shall be deemed guilty of a misdemeanour, and upon conviction thereof shall be fined not less than 25 nor more than 100 dollars.

12. Not known.

STATE OF MONTANA.

1 to 6. No information.

7. State Law penalty not exceeding five or less than two years' imprisonment. If by woman, and child would have been a bastard, penalty not exceeding one year; but she may be indicted and punished for murder of bastard child.

8 to 12. No information.

UNITED STATES—*continued.*

STATE OF NEBRASKA.

1 to 6. No information.

7. State Law chapter 6, sect. 38. Penalty not more than one year's imprisonment or fine not exceeding 500 dollars, or both such fine and imprisonment.

STATE OF NEVADA.

Dear Sir, Carson City, June 21, 1892.

No special Law regulating stillbirths on our Statutes. Certificates of births and of deaths are required to be recorded with County Recorder. Certificates of births must be signed by physician or midwife, and certificates of death by undertaker at burial. No special law recognising midwives, but we have a law requiring practitioners of medicine or surgery to record their diploma. There is also a law on our books against concealing deaths of bastards. Heavy penalties are affixed for violations in any of above cases.

(signed) *E. D. Vanderheth.*
Private Secretary.

Denis Donohoe, Esq., British Consulate,
San Francisco, Cal.

STATE OF NEW HAMPSHIRE.

1. Compulsory under chapter 173 of Public Statutes.

2. Yes.

3. As births and deaths.

4. The Laws supply no definition.

5. Fine not exceeding 100 dollars.

6. Two hundred and twenty in 1889.

7. For procuring miscarriage, fine not exceeding 1,000 dollars and imprisonment not exceeding 10 years.

8. No regulations. No forms of certificate procurable.

9. Yes.

10. Not professionally. No statistics.

11. No regulations.

12. In 1889 nearly 6 per 1,000 of women confined.

STATE OF NEW JERSEY.

1. Compulsory (Chapter 34), Laws of New Jersey, 1888.

2. Registration is made by the official who registers ordinary births and deaths.

3. Separately as stillbirths.

4. One that does not breathe after birth.

5. A fine of 20 dollars.

6. One thousand seven hundred and ninety-five (1,795).

7. Hanging, but practically all verdicts are modified.

8. There are no regulations, but the Form of Certificate has been approved by the Board of Health, and the directions and definitions contained therein are regulations of the Board. The Form of Certificate is as follows :—

Answer No. 8—*continued.*

RETURN OF A STILLBIRTH.

"Stub" to be retained by person making Return.

RETURN OF STILLBIRTH.

1. Place of birth (in full)

2. Date of birth 189

Sex Color

3. Parent's names

4. Residence of mother (in full)

5. Period of utero-gestation

6. Country of mother's birth

Country of father's birth

7. Cause of dead birth

Name of attendant

Name of undertaker

Place of burial

1. Place of birth

[If in city, give name, street and number; if not, give township and county.]

2. Date 189 Sex Color

3. Name of mother Name of father

4. Residence of mother Age

[If in city, give name, street and number; if not, give township and county.]

5. Period of utero-gestation How many previous children No Living

6. Country of mother's birth Of father's

7. Cause of dead-birth (if known)

I, as the attendant in charge, certify that the Child was dead before birth.

Undertaker. Attendant.

Place of burial. P. O. Address.

9. Yes.
10. Midwives are recognised by the State, but the bulk of the midwifery practice is not in their hands.
11. Examination and registration are necessary.
12. Not known.

STATE OF NEW MEXICO.

1. No.
2. No.
3. They are registered as deaths.
4. A child absolutely born dead.
5. There are none.
6. Not known.
7. This comes under the criminal head of abortion, and is punishable by not less than two years, and if it be done without the woman's consent the punishment shall be doubled.
8. There are none.
9. Yes. Stillbirth being returned as a death.
10. Midwives are not recognised by the State, but the bulk of the midwifery practice is in their hands.
11. No regulations.
12. Not known.

NEW YORK STATE.

1. Not compulsory.
2. Registration is made by the official who registers ordinary births and deaths.
3. They are neither recorded as births nor as deaths. The return of a stillbirth is merely kept on file in the office of the local Board of Health, and not made a matter of record, nor reported to the State Department.
4. One that has never breathed.
5. None.
6. Not known. No return of stillbirths is made to the State Department.
7. The offence is manslaughter in the first degree, and the penalty is imprisonment for not less than five nor more than 20 years.
8. There are no regulations, but the form of certificate has been approved by the Board of Health, and the directions and definitions contained therein are regulations of the Board. The form of certificate is as follows :—

N.B.—No remains of the deadborn should be interred, or disposed of in any other manner, without a permit therefor having been obtained from this Bureau, such permit to be granted upon the presentation of the proper certificate.

RETURN OF A STILLBIRTH.

In the of
County of , N. Y.

The death of an infant that has breathed must not be returned as a stillbirth ; such deaths should be certified in the usual manner, after returning the birth record.

Name of mother
Name of father
Place of birth
Residence of mother
Period of utero-gestation
Date of this birth
Sex Colour
Nativity of mother Of father
Cause of deadbirth (if known)
Residence of medical attendant
Signature of person making this return
Residence ditto
Date 189
Undertaker
Place of burial

9. Yes.

10. No, except that they are required to report births, and no obstacle is put in the way of women acting as midwives. The bulk of the midwifery practice is in the hands of properly qualified medical practitioners.

11. None, and no licenses are issued to them.

12. Not known.

NEW YORK CITY.

1. Compulsory. (New York City Consolidation Act of 1882, Sections 602 to 605; Sanitary Code, Sections 160, 161, and 163, and the Rules and Regulations of the Board of Health, Sections 37 to 40.)

2. Registration is made by the official who registers ordinary births and deaths.

3. Stillbirths are registered by themselves, being counted for statistical purposes as neither births nor deaths. The statistics of births and deaths are considered to treat only of human beings who have lived in the world as independent individuals.

4. One that has never breathed.

5. A penalty of 10 dollars, which is recovered by a civil suit brought by Board of Health under Section 605 of New York Consolidation Act 1882.

6. Three thousand three hundred and fifteen (3,315).

7. The offence is manslaughter in the first degree and the penalty is imprisonment for not less than five nor more than 20 years.

8. There are no regulations, but the form of certificate has been approved by the Board of Health, and the directions and definitions contained therein are regulations of the Board. The form of certificate is as follows:—

N.B.—No Fœtus should be interred or disposed of in any other manner, without a permit therefor having been obtained from this Division, each permit to be granted upon the presentation of the proper return.

CERTIFICATE OF A STILLBIRTH.

The death of an infant that has breathed must not be returned as a Stillbirth; such deaths should be certified in the usual manner, after returning the birth record.

Bureau of Records, Health Department, City of New York,
301, Mott-street, New York.

Name of mother
Name of father
Place of birth
Residence of mother
Period of utero-gestation
Date of this birth
Sex colour
Nativity of mother of father
Cause of death-birth (if known)
Signature of medical attendant
Residence do.
Name of other person making this return
Residence do. do. do.
Date 189
Undertaker
Place of burial

9. Yes.

10. No, except that they are required to report births, and no obstacle is put in the way of women acting as midwives. The bulk of the midwifery practice is in the hands of properly qualified medical practitioners.

11. Required to register name and residence with the Health Department.

12. About 7 per 1,000 resulting directly from the puerperal condition. The rate per 1,000 of women who die in the four weeks immediately following confinement is unknown.

UNITED STATES—*continued.*

STATE OF NORTH CAROLINA.

1. In about 14 of the larger towns of North Carolina certificates of death are required before a body can be interred; this includes stillbirths. From these recorded burial certificates the County Superintendent of Health makes returns.
2. There is no registration of births in force in this State.
3. As both.
4. None.
5. None, except a refusal of permission to bury, and this is not effectual.
6. The numbers cannot be given.
7. Imprisonment in the penitentiary for not less than a year, or more than 10 years.
8. These are not different from other death certificates.
9. No.
10. The bulk of midwifery cases fall into the hands of negro midwives.
11. There is no legal enactment.
12. It is not known.

STATE OF OHIO.

State Board of Health,
Office of the Secretary, Columbus, Ohio,
26 July 1892.

Dear Sir,

YOUR letter of 18th July at hand. Your queries referred to this office were not answered because your address was not furnished to me.

Only a general answer can be made to your question. There is no State registration of stillbirths, and no registration of physicians and midwives in Ohio. A registration of births and deaths is made annually for the State by assessors at the time of listing personal property. The records are inaccurate and incomplete.

In addition, our cities and large towns register all births and deaths, and most of them take cognisance of stillbirths.

There is no uniformity in the certificates used, nor in the system of registration.

Reports of stillbirths and deaths in municipalities are made monthly to this office, and I have adopted the plan of classifying premature and stillbirths separately. In many of our cities, however, they are charged to the deaths and included in the death rates.

The penalty in this state for criminally causing a child to be stillborn is imprisonment for not more than seven years, nor less than one year.

Regretting that the registration of stillbirths has received so little attention in Ohio,

I am, &c.
(signed) *C. O. Probst*, M.D.,
Secretary.

Mr. R. C. Clipperton,
British Consulate, Phila. Pa.

STATE OF OREGON—CITY OF PORTLAND.

1. No State law, but generally a city ordinance.
2. Yes.
3. As both.
4. A child that dies before it has been entirely detached from the mother.
5. A fine of 10 dollars.
6. Four.
7. The penalty for causing an abortion is imprisonment in the penitentiary from one to 15 years, and by a fine not exceeding 5,000 dollars.
8. Copy of regulations and of certificate of death, as used here, as follows:—

EXTRACT from Health Ordinance of the City of Portland, Oregon.

Section 6. Every person practising midwifery in this city, under whose charge or superintendence births shall hereafter take place, shall keep a true and exact register of such births, and shall enter the same on a blank schedule to be furnished by the

UNITED STATES—STATE OF OREGON—CITY OF PORTLAND—*continued.*

Answer No. 8—*continued.*

health officer; this schedule shall contain a list of births which have occurred under his or her care during the month, and shall set forth, as far as can be ascertained, the full name of such child (if any name shall have been conferred), its sex, colour, the full name, occupation, and nativity of its parent or parents, the date and place of birth; and the said schedule shall be delivered duly signed by such practitioner in the form of a certificate, on the first day of each and every month, to the health officer, or to any authorised person calling for the same. In case the birth of any child shall have occurred without the attendance of a physician or practitioner of midwifery, or should no other person be in attendance upon the mother immediately thereafter, it shall then become the duty of the parent or parents of such child to report its birth to the health officer in the manner and form and within the period above required.

CERTIFICATE OF DEATH.

Portland, Or., 189

This certifies, that:

Name in full, { Write legibly and spell correct. If an infant not named, give name of parents. }

Aged years months days.

Occupation male or female

Place of birth. (State or County)

Previous residence

Particular place of death

Date of Death } If a minor { Father's birthplace

Date of Burial } { Mother's birthplace.

Place of interment Cemetery.

Single or married Race

Undertaker.

Physician's Certificate.

I certify, that I have attended the above described decedent from

to 189; also that the cause of death was

which was contracted at

M.D.

Please insert the locality, if known, where the disease was contracted.

9. If she has a diploma as M.D., not otherwise.

10. Not specially recognised by the State, neither is the bulk of the midwifery practice in their hands.

11. No special regulations under which they are allowed to practise.

12. Not known. Generally the registration of births is very carelessly carried out by local regulations.

STATE OF PENNSYLVANIA.

The State Board of Health of the Commonwealth of Pennsylvania represents that there is no general law for the registration of vital statistics in the State. Every city, however, has the right to adopt such a system. The law authorising registration in cities makes no special reference to stillbirths. There are, therefore, no statute laws upon this subject. This statement virtually answers all the questions as regards this State. The only law upon the subject is common law. There are no laws recognising midwives, and only a comparatively small portion of the midwifery practice is in their hands.

[The

UNITED STATES—STATE OF PENNSYLVANIA—*continued.*

[The following information has been obtained respecting the leading cities of the State.]

CITY OF PHILADELPHIA.

1. Yes. Act of 8th March 1860.

EXTRACT from Act No. 146 of the Law of the General Assembly of the State of Pennsylvania. Approved 8th March 1860.

Section 6.—Every person practising midwifery in the city aforesaid, under whose charge or superintendence a birth shall hereafter take place, shall keep a true and exact register of such birth, and shall enter the same on a blank schedule to be furnished by the health officer. This schedule shall contain a list of the births which have occurred under his or her care during the month, and shall set forth, as far as the same can be ascertained, the full name of each child (if any name shall have been conferred), its sex, colour, the full name and occupation of its parent or parents, the day and place of its birth; and the said schedule shall be delivered, duly signed by the practitioner, in the form of a certificate, on the first day of each and every month, to the health officer, or to any authorised person calling for the same. In case the birth of any child shall have occurred without the attendance of a physician, or a practitioner of midwifery, or should no other person be in attendance upon the mother immediately thereafter, it shall then become the duty of the parent or parents of such child to report its birth to the health officer, in the manner and form and within the period above required.

EXTRACT from Rules and Regulations for the Government of Superintendents of Burying Grounds and Vaults, Sextons, Undertakers and Others in the City of Philadelphia (2 February 1892).

Rule 242. (*a.*) No interment of the dead body of any human being, or disposition thereof in any tomb, vault, or cemetery, nor the removal of any body from the city for interment elsewhere, shall be allowed without a permit therefore be granted by the Board of Health upon presentation of the certificate of death; and no sexton, superintendent, or other person shall assist in, or assent to, or allow any such interment, for any such body for which such permit has not been presented authorising the same. Every certificate of death must be signed either by a physician, the coroner, or health officer, to which must be appended the certificate of the undertaker.

2. Yes.

3. Both.

4. "A child born still or lifeless. Dead born."—"Dunglison's Dictionary."

5. Ten dollars for each offence (Act 8th March 1860).

Section 89 of Act No. 374, Title VI., of the Laws of the General Assembly of the State of Penna. Approved 31 March 1860.

Section 89.—If any woman shall endeavour privately, either by herself or the procurement of others, to conceal the death of any issue of her body, male or female, which, if it were born alive, would by law be a bastard, so that it may not come to light, whether it was born dead or alive, or whether it was murdered or not, every such mother, being convicted thereof, shall suffer an imprisonment, by separate or solitary confinement at labour, not exceeding three years.

6. Yes, 1202.

7. *See* Act 31 March 1860, Sections 87 and 88.

SECTIONS 87 & 88 of Act No. 374, Title VI., of the Laws of the General Assembly of the State of Penna. Approved 31 March 1860.

Section 87.—If any person shall unlawfully administer to any woman, pregnant or quick with child, or supposed and believed to be pregnant or quick with child, any drug, poison, or other substance whatsoever, or shall unlawfully use any instrument or other means whatsoever, with the intent to procure the miscarriage of such woman; and such woman, or any child with which she may be quick, shall die in consequence of either of said unlawful acts, the person so offending shall be guilty of felony, and shall be sentenced to pay a fine not exceeding 500 dollars, and to undergo an imprisonment, by separate or solitary confinement at labour, not exceeding seven years.

Section 88.—If any person, with intent to procure the miscarriage of any woman, shall unlawfully administer to her any poison, drug, or substance whatsoever, or shall unlawfully use any instrument, or other means whatsoever, with the like intent, such person shall be guilty of felony, and being thereof convicted, shall be sentenced to pay a fine not exceeding 500 dollars, and undergo an imprisonment, by separate or solitary confinement at labour, not exceeding three years.

8. Same as other birth and death certificates.

FORM A.

RETURN OF BIRTHS, in the City of PHILADELPHIA, under my care for the month of 189

Made to the Health Officer in conformity with the Act of Assembly.

This Sheet is for One Month only.

DATE OF BIRTH.	NAME OF CHILD.	SEX.		COLOUR.		PLACE OF BIRTH.		NAMES OF PARENTS.	OCCUPATION OF FATHER.
		Male.	Female.	White.	Black.	Ward.	Number and Street.		

I certify that the above Return is correct, according to the best of my knowledge and belief.

M.D.

Residence

FORM B.

RETURN OF A DEATH IN THE CITY OF PHILADELPHIA.

Physician's Certificate.

1. Name of deceased
2. Colour
3. Sex
4. Age
5. Married or single
6. Date of death
7. Cause of death

M.D.

Residence

Undertaker's Certificate in Relation to Deceased.

8. Occupation
9. Place of birth
10. When a minor { Name of father / Name of mother
11. Ward
12. Street and number
13. Date of burial
14. Place of burial

Undertaker.

Residence,

This constitutes one Certificate. To be returned by the Superintendent of Cemetery to Health Office on Saturday of each week before 12 m.

9. Yes.

10. Midwives are recognised by the State, but the bulk of the midwifery practice is not in their hands.

11. By the Act 8th March 1860.

UNITED STATES—STATE OF PENNSYLVANIA—CITY OF PHILADELPHIA—*contd.*

Answer No. 11—*continued.*

EXTRACT from Section 2 of Act No. 146 of the Laws of the General Assembly of the State of Penna. Approved 8 March, 1860.

Section 2.—That it shall be the duty of . . . . . every practitioner of midwifery . . . . . on or before the 1st day of July next ensuing (the day in which the law goes into effect), to report his, her, or their names and places of residence to the health officer, at the office of the Board of Health: and it shall be the duty of the health officer to have the same properly registered in index form in suitable books to be furnished to the city commissioners at the order of the Board of Health. In the event of any of the persons above specified removing to any other place of residence, it shall be their duty to notify the health officer of the fact within 30 days after such removal, except where the persons removing shall cease to act in such official capacity as makes them subject to the provisions of this Act.

12. Not ascertainable.

CITY OF READING.

1. Yes; the Act of Assembly creating Boards of Health. Approved 5th May 1876.
2. Yes.
3. Both.
4. Deadborn.
5. From 5 dollars to 20 dollars.
6. Seventy stillborn. Total births for 1890, 1,643.
7. Not to exceed 500 dollars fine, or not to exceed seven years in prison.
8. Certificate upon which all births are made.
9. Yes.
10. Midwives are recognised by the State, but the bulk of the midwifery practice is not in their hands.
11. No regulations that we know of.
12. One to every 600 for 1891 in our city.

CITY OF PITTSBURGH.

1. We do not register stillbirths.

2. Physicians or midwives are required to return to the Bureau of Health all cases of stillbirth on a proper blank furnished by that office, and on receipt of same we issue a permit for the burial of said stillbirth. The form of return is as follows:—

DEPARTMENT OF PUBLIC SAFETY.—BUREAU OF HEALTH.

RETURN OF A STILLBIRTH.

☞ The death of an infant that has breathed must not be returned as a stillbirth; such deaths shall be certified in the usual form, and return made in birth record.

☞ No fœtus shall be interred, or body disposed of in any manner, without the presentation of a proper return at this office.

TO THE OFFICE OF REGISTRAR OF VITAL STATISTICS, BUREAU OF HEALTH OF THE CITY OF PITTSBURGH.

Name of mother,
Name of father,
Residence of mother,
Period of utero-gestation,
Date of this birth, 189
Sex, Colour,
Nativity of mother, of father
Cause of dead-birth *
Signature of medical attendant, M.D.
Residence " "
Name of other person making this return,
Residence " " "
Date of return, 189
Undertaker,
Place of burial Cemetery.
Date of burial, 189

* In stating the cause of dead-birth, the nature and conditions should be given as fully and accurately as possible. When the true cause of dead-birth is unknown, the *probable* cause should be given and so indicated.

UNITED STATES—STATE OF PENNSYLVANIA—CITY OF PITTSBURG—*continued.*

3 and 4. The legal definition of a stillborn child is understood to be a child born dead. If it breathes once after birth it is then not stillborn, and the attendant is required to return it to the Bureau of Health as a birth.

5. There are no penalties for failure to register stillbirth.

6. The number of stillborn children interred and returned to the Bureau of Health for the year 1890 numbers 385. Total births for year 6,320.

7. Criminally causing a child to be stillborn would be abortion, which is severely punished.

8. *See* 2.

9. A return of a stillbirth signed by a midwife is accepted.

10. Midwives are recognised by the State. Midwives attend, possibly, about 30 per cent.

11. Midwives are required to register in the office of the Clerk of Courts the same as regular physicians.

12. Not known.

STATE OF RHODE ISLAND.

1. Compulsory (Public Laws, Chapter 85).

2. Registration is made by the official who registers ordinary births and deaths.

3. Births and deaths.

4. Full-developed child born dead.

5. A penalty not exceeding 20 dollars.

6. Two hundred and ninety-six (296).

7. Imprisonment for not more than 20 years.

8. Regulations contained in the ordinary certificate of death which is used in the case of a stillbirth. The forms and regulations are as follows :—

RETURN OF A DEATH.

STATE OF RHODE ISLAND.

1. Date of death?	189
2. Name in full?	
3. Age?	Years Months Days
4. Place of death?	City or Town
5. Street and No.?	
6. Sex?	
7. Colour?	
8. Single, married, widowed, or divorced?	
9. Occupation?	
10. Place of birth?	
11. Father's name?	
12. Mother's name?	
13. Parent's birthplace?	Fa. Mo.
14. Where buried?	
15. Cause of death? See Note below.	Primary Secondary
	Informant.

☞ This return should be made to the city or town clerk before the burial, entombment, or removal of the decedent from the town where the death occurred.

N.B.—At No. 4 give name of city or town. At No. 5, if no named street, state what village or school district. At No. 8 state whether married or single, widow or widower. At No. 13 state the country in which each parent was born. At No. 15 state the cause of death from as reliable information as possible, giving first disease or cause, and also secondary, if any.

Question 15 must be answered. If the informant does not know, then the circumstances attending the death must be stated. The medical examiner should be called when the cause is not known.

Undertaker's returns may be sent by letter to the town or city clerk of the town or city where the death occurred when the cause of death is included.

UNITED STATES—STATE OF RHODE ISLAND—*continued.*

Answer No. 8—*continued.*

PHYSICIAN'S CERTIFICATE.

1. Name?
2. Date of death?
3. Disease? Primary.
4. Disease? Secondary.
5. Duration of disease? Primary. Secondary.

Physician.

I certify that the above is a true return, to the best of my belief,

Undertaker.

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UNDERTAKERS' DUTIES.

Extracts from the Public Laws, Chapter 747.

Section 8.—No undertaker or other person shall conduct a funeral, or bury or deposit in a tomb, or remove from this State, or otherwise dispose of the remains of any deceased person . . . . . unless he shall first obtain the physician's certificate required by section six of this chapter, if a physician was in attendance upon such person who has deceased . . . . . and shall return the same, together with his own certificate of the information required by section three of this chapter, to the town clerk of the town where such death or bringing forth took place. Provided, however, that in such towns as allow the burial or removal of the bodies of deceased persons without a permit from the town clerk, and if the undertaker or other person who has charge of the disposal of the remains of the deceased person is unable to obtain the said physician's certificate after reasonable attempts therefore before the burial or removal of the said remains, then the said undertaker or other person shall make his return as required by section three of this chapter, including the cause of death, and the name of the physician last in attendance upon the deceased, immediately to the town or city clerk or registrar of the town or city in which the death occurred. He shall also within two days thereafter notify the physician last in attendance upon the deceased person of the name and date of death of the same. (Blanks for such notice to physicians can be obtained from town clerks and the State Registrar, upon application therefore.)

Section 11.—Every clergyman, physician, undertaker, town clerk, clerk of any meeting of the Society of Friends, or other person who shall wilfully or unreasonably neglect or refuse to perform any of the duties imposed on or required of him by this chapter, shall be fined not exceeding twenty dollars, nor less than two dollars for each offence, one-half thereof to the use of the town in which the offence shall occur, and one-half thereof to the use of the person who shall complain of the same.

Section 12.—Every clergyman, physician, coroner, undertaker, medical examiner, or clerk of any meeting of the Society of Friends, shall cause his name, residence, and post office address to be recorded in the town clerk's office of the town where he resides.

9. Yes.

10. No, except that they are required to report births, and no obstacle is put in the way of women acting as midwives. The bulk of the midwifery practice is in the hands of properly qualified medical practitioners.

11. None, and no licenses are issued to them.

12. 3·8 per thousand.

STATE OF SOUTH CAROLINA.

[EXTRACT from letter from Her Majesty's Consul at Charleston, South Carolina.]

I beg to report that under the General Statutes of the State of South Carolina there are no specific provisions respecting stillbirths, the matter being left to the County or City Local Authorities and to the action of the Common Law, in so far as the penalties for criminally causing abortion, or murder, are applicable.

The regulations at the City of Charleston on the subject, now in force, are as follows:—

1. The registration of stillbirths is compulsory. The law requiring this is found in the Revised Ordinances of the City of Charleston, Sections 220, 221, and 222, dated

Answer No. 1—*continued.*

October 12th, 1877, make it obligatory on the part of the physician, midwife, or attendant, under a penalty of 50 dollars fine, to report every stillbirth to the Bureau of Vital Statistics, Board of Health, Charleston, for registration; such report to be made within three days after its occurrence.

The special form used for this purpose is as follows :—

RETURN OF A STILLBIRTH.

Bureau of Vital Statistics, Board of Health,
Charleston, South Carolina.

The death of an infant that has breathed must not be returned as a Stillbirth ; such deaths should be certified in the usual manner.

Name of mother

Name of father

Residence of mother

Period of utero-gestation

Date of this birth

Sex colour

Number of child of mother

Nativity of mother of father

Cause of dead-birth (if known)

Name of medical attendant

Residence do.

Name of other person making this return

Residence do. do.

Date 18

Undertaker

Place of burial

2. The registration is carried out by the same authorities that register ordinary births and deaths, that is to say, the Department of Health.

3. Stillbirths are registered as births, but they are reported by the physician or other attendant as both births and deaths.

4. The legal definition of a stillborn child is simply a stillbirth or death.

5. The penalty for neglecting to register a stillbirth is a fine not exceeding 50 dollars, or imprisonment for not more than 30 days.

6. The number of officially registered and interred stillborn children in 1890 were:— Whites 39, and negroes 169; making a total of 208 for the year.

7. The penalties for criminally causing a stillbirth are only those provided for by the Common Law for taking life unlawfully, *i.e.*, the various grades of murder.

8. The regulations on the subject are general, requiring that all births, including stillbirths, be registered by the health officer within three days after their occurrence.
The form used for registering stillbirths is as follows :—

UNITED STATES—STATE OF SOUTH CAROLINA—*continued.*

Answer No. 8—*continued.*

CITY OF CHARLESTON, S.C., DEPARTMENT OF HEALTH.

RETURN OF A BIRTH

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1. Full name of child (if any)
2. Sex — No. of child of mother
3. Race or colour (if not of the white races)
4. Date
5. Place of birth
6. Full name of mother
   (Maiden name)
7. Mother's birthplace
8. Mother's residence
9. Full name of father
10. Father's occupation
11. Father's birthplace

Name of attendant

Address of attendant

Within Three Days from the time of a Birth this Form of Report must be filled out and returned to the Board of Health.

(Extract from the Ordinance.)

Section 3.—"That every person who shall omit to make and keep the registry hereinafter required, or who shall omit to report a written copy of the same to the City Registrar within three days after any birth or marriage, or who shall make a false or fictitious entry in his or her record of births or marriages, or in the certified copy of such register delivered to the City Registrar, shall be subject for each and every such omission or false entry to a fine of not more than fifty dollars; and in default of paying the same, shall suffer imprisonment not exceeding thirty days."

(*Counterfoil.*)

1. Full name of child (if any)
2. Sex — No. of child of mother
3. Race or colour
4. Date
5. Place of birth
6. Full name of mother
   (Maiden name)
7. Mother's birthplace
8. Mother's residence
9. Full name of father
10. Father's occupation
11. Father's birthplace

OTHER MEMORANDA.—Physiologists and Statists desire a record to be made in answer to the following questions: the answer to the first may eventually be called for in the Public Registers:

(1.) Age of father ____ years : age of mother ____

(2.) Weight of child at birth ____ lbs. ____ ozs.

(3.) Duration of labour ____ hours.

9. The authorities accept a certificate of a stillbirth signed by a midwife.

10. Midwives are recognised by the State Authorities; a large part, perhaps the bulk of the practice, is in their hands.

11. There are no special regulations with reference to allowing midwives to practice.

12. It is not known what is the rate per 1,000 of women who die in their confinements, or within four weeks thereafter.

STATE OF TENNESSEE.

No information furnished.

STATE OF TEXAS.

1. No.
2. No.
3. They are registered as deaths.
4. A child absolutely born dead.
5. There are none.
6. Not known.
7. This comes under the criminal head of abortion, and is punishable by not less than two years, and not more than five years; and if it be done without the woman's consent, the punishment shall be doubled.
8. There are none.
9. Yes. Stillbirth being returned as a death.
10. Midwives are not recognised by the State, but the bulk of the midwifery practice is in their hands.
11. No regulations.
12. Not known.

TERRITORY OF UTAH.

Executive Office, Salt Lake City, Utah,
July 2, 1892.

Sir,

I have the honour to acknowledge the receipt of your letter of June 20th, 1892, and to say in reply that the Territory of Utah has no Law requiring the registration of stillbirths.

(signed) *Arthur L. Thomas,*
Governor.

The British Consul, San Francisco,
California.

STATE OF VERMONT.

1. Not compulsory. No mention of stillbirths in the Statutes.
2. Yes.
3. As deaths.
4. The Laws supply no definition.
5. No penalty.
6. Two hundred and thirty-one in 1889.
7. For criminally causing or attempting to cause miscarriage, not more than five or less than three years' imprisonment, but no penalty on woman whose miscarriage is caused or attempted. If woman dies not more than 20 or less than five years' imprisonment. For giving advice for the purpose, not more than 10 or less than three years' imprisonment; and for selling or giving away anything for the purpose, not more than three or less than one year's imprisonment.
8. No regulations. No forms of certificates procurable.
9. Yes.
10. Only to the extent that none but those certificated by a medical society may advertise as such. No statistics.
11. No regulations.
12. Not known.

UNITED STATES—*continued.*

STATE OF VIRGINIA.

1. Section 2,235, Code 1887, requires the Commissioner of Revenue to record in a book kept by him for the purpose, a list of births, and to state whether the child was born alive or stillborn.

2. Yes.

3. Births.

4. Not defined by Statute.

5. Five dollars in each case of birth omitted.

6. Not known here.

7. Felony.

8. Same as form for births, date, and place; full name; colour; whether born alive or stillborn; name of mother; and name, residence, and occupation of father.

9. Not known.

10. Not licensed.

11. Not licensed.

12. Not known.

STATE OF WASHINGTON.

1. It is. The regulations made by the State Board of Health. *See* blank forms enclosed—"Birth Return"; "Death Return."

2. Yes.

3. Both.

4. Stillborn.

5. For failure to do so, liable to fine of 10 dollars.

6. Not known. The law went into force in June 1891.

7. Penal offence.

8. The "birth" and "death" returns are as follows:—

BIRTH RETURN.

1. Name of child (*a*)
2. Date of birth
3. Place of birth
4. Sex
5. Colour (*b*)
6. Alive or stillborn.
7. Legitimate or illegitimate.
8. Mother's maiden name
9. Mother's age last birthday
10. Colour (*b*)
11. Number of child born to this mother
12. Mother's birthplace (*c*)
13. Father's name
14. Father's age last birthday
15. Colour (*b*)
16. Father's occupation.
17. Father's birthplace

State of Washington, County of ss.

I hereby certify that the above is a true return of the said birth, and of the other facts there recorded.

Dated at Washington, this
day of 189
M.D. (*d*)

NOTE.—(*a*) Give surname and christian name, if child has been named.
(*b*) State colour distinctly, so race may be known, as white, black, mulatto, Indian, Chinese, mixed white and Indian, &c.
(*c*) Give state or foreign country, so nationality is plainly shown.
(*d*) If returned by any other than physician, sign as: Accoucheur, parent, coroner, &c.

Answer No. 8—*continued.*

DEATH RETURN.

1. Name of deceased
2. Date of death
3. Age last birthday
4. Sex
5. Colour (*a*)
6. Married, single, widow or widower
7. Place of death
8. Disease or cause of death
9. Birthplace (*b*)
10. Residence
11. Occupation
12. Father's name
13. Father's birthplace (*b*)
14. Mother's maiden name
15. Mother's birthplace (*b*)

State of Washington, County of , ss.

I hereby certify that the above is a true return of the death, and of the other facts there recorded.

Dated at , Washington, this

day of 189

M.D. (*c*)

NOTE.—(*a*.) State colour distinctly, so race may be known, as white, black, mulatto, Indian, Chinese, mixed white and Indian, &c.
(*b*) Give state or foreign country, so nationality is plainly indicated.
(*c*) If returned by any other than physician, sign as: Accoucheur, parent, coroner, &c.

9. See blank forms enclosed. (Answer No. 8.)

10. Yes, they are. No.

11. There are no regulations.

12. There are no statistics at present available.

STATE OF WEST VIRGINIA.

1. "Every assessor shall make an annual registration of the births and deaths in his district He shall record, in a book to be furnished him for that purpose, as far as can be ascertained, the date and place of every such birth, the full name of the child, if it has a name, the sex and colour thereof, also whether the child was born alive or stillborn." (Code W. Va., Chap. 63, Sec. 19.)

2. It is See answer to previous question.

3. As stillbirths.

4. Reference is made to answer in Question 1.

5. "If any assessor fail to obtain any information respecting a birth or death, which he is by this Chapter authorised or required to obtain, and which he can procure, he shall, for every such failure to record the information acquired by him, respecting a birth or death, according to this Chapter, forfeit five dollars." [(1891) Code W. Va., Chap. 63, Sec. 34.]

6. Each assessor files with the clerk of the county court a tabulated or alphabetical statement of all marriages, births, and deaths within his district. Each county clerk is required to report to the secretary of State Board of Health, who is Registrar of Vital Statistics, on blanks furnished by such secretary, such information respecting births, marriages, and deaths, annually or oftener if required, as may be deemed proper by such secretary.

Number of stillborn children as stated in report of secretary of State Board of Health 1889–90, from 30th June 1889 to 1st July 1890, 173.

7. "Any

UNITED STATES—STATE OF WEST VIRGINIA—*continued.*

7. "Any person who shall administer or cause to be taken by a woman any drug or anything or use any means with intent to destroy her unborn child, or to produce abortion or miscarriage, and shall thereby destroy such child or produce such abortion or miscarriage, shall be confined in the penitentiary not less than three years nor more than ten years. No person by reason of any act mentioned in this section shall be punishable where such act is done in good faith with the intention of saving the life of such woman or child." (Code W. Va., Chap. 144, Sec. 8.)

8. These are registered in the books furnished the several assessors by the auditor.

9. Information respecting stillbirths is obtained by the assessor from the head of each family, if practicable, by verbal interrogation.

10. They are not.

11. There are no regulations on this subject.

12. Cannot be ascertained from reports and statistics at hand.

STATE OF WISCONSIN.

1. Yes. State Law compels the registration of all births, Chapter XLVII. Section 1023, and deaths Section 1024.

2. Yes.

3. No information furnished.

4. No information furnished.

5. Not less than 50 dollars nor more than 100 dollars.

6. No information furnished.

7. State Law, Section 4352. Producing abortion is manslaughter of the second degree unless to save life of woman; penalty not more than seven nor less than four years' imprisonment. Section 4583, producing miscarriage: penalty not more than one year or less than six months' imprisonment, or fine not exceeding 500 dollars nor less than 250 dollars, or both at discretion of court. If by woman not more than six nor less than one month, or fine not exceeding 100 dollars, and for concealing death of bastard child one year to six months' imprisonment, or fine not exceeding 300 dollars nor less than 100 dollars.

8. No information furnished.

9. No information furnished.

10. Yes.

11. The profession of midwife is lawful, but the distinct meaning of the word is not determined. No one practising physic or surgery can testify unless they have received diploma, or be a member of a state or county medical society.

12. No information furnished.

STATE OF WYOMING.

1 to 6. No information furnished.

7. State Law:—

Section 879. Poisoning—Abortion. Penalty, 800 dollars and imprisonment, not exceeding five nor less than one year in penitentiary, and if woman dies not less than three years' imprisonment and fine not exceeding 1,000 dollars, unless to save life of woman.

Section 880. Penalty for woman causing death of illegitimate child, imprisonment not exceeding one year, but does not prevent mother from being indicted and punished for murder of such child.

8 to 12. No information furnished.

QUESTIONS.

1. Whether the registration of stillbirths is compulsory; and, if so, what Act regulates this?

2. Is the registration carried out by the authorities who register ordinary births and deaths?

3. Are stillbirths registered as births or deaths or both?

4. What is the legal definition of a stillborn child?

5. What are the penalties for neglecting to register a stillbirth?

6. Is the number of stillborn children interred and registered in the year 1890 known; and, if so, what was such number?

7. What are the penalities for criminally causing a child to be stillborn?

8. Copy of regulations and forms of certificates used in registering stillbirths?

9. Is a certificate of stillbirth, signed by a midwife, accepted by the registering authorities?

10. Are midwives recognised by the State, and is the bulk of the midwifery practice in their hands?

11. Under what regulations, if any, are midwives allowed by the State to practise?

12. Is it known, and, if so, what is the rate per 1,000 of women who die in their confinements or in the four weeks immediately following?

SUMMARY.

UNITED KINGDOM.

Number of Question and Reply.	England and Wales.	Scotland.	Ireland.
1.	No - - - - - -	No - - - - - -	No.
2.	No - - - - - -	No - - - - - -	No.
3.	Neither - - - - -	Neither - - - - -	Neither.
4.	No legal definition. Understood to mean "not born alive."	Not legally defined. Understood to mean a child who has never breathed after parturition.	Not legally defined, otherwise than as a child which has not lived by reason of breathing through its own lungs alone.
5.	None - - - - - -	None - - - - - -	None.
6.	In Burial Board Cemeteries, 17,335; number interred elsewhere not known.	Not known - - - -	Not known.
7.	For procuring abortion, maximum punishment penal servitude for life. Not otherwise punishable except in cases in which the law of murder applies.	Comes within the crime of procuring abortion, the punishment for which is arbitrary.	As in England.
8.	None - - - - - -	None - - - - - -	None.
9.	Certificate not required - -	Certificate not required -	Certificate not required.
10.	(*a*) No - - - - - (*b*) It is estimated that two-thirds of the midwifery practice is in their hands.	(*a*) No - - - - - (*b*) Not known - - -	(*a*) No. (*b*) No positive knowledge, but believed to be.
11.	There are none - - -	There are none - - -	There are none.
12.	Not known - - - -	In 1889 the total number of deaths of females from child-birth diseases was 623, or 17 per 1,000 of the total deaths (females).	During 1881-90 the annual average of deaths from accidents of child-birth was 488, and from puerperal fever 325; total 813, or 7·1 per 1,000 of the average annual number of births registered.

EUROPEAN COUNTRIES.

SUMMARY—*continued.*

Number of Question	FRANCE.	SPAIN.	GERMANY.					
			GERMAN EMPIRE.	BAVARIA.	SAXE-COBURG-GOTHA.	HESSE.	BADEN.	SAXONY.
1	Yes; Decree of 1806 -	For purpose of burial only. Royal Order of 1871.	Yes; Act of 1875 - -					
2	Yes - - - -	No; by the municipal courts.	Yes - - - - -					
3	As deaths - - -	As deaths; for purpose of burial only.	As deaths - - -	Same for the whole of the German Empire.				
4	None - - - -	Not definitely determined	None - - - - -					
5	*See* full answer - -	Fines for non-compliance with burial regulations.	Fines, as in case of other registrations.					
6	*See* full answer - -	Yes; 7,830 - - -	No - - - - -	Yes; 6,436 - -	Yes; 231 - - -	Yes; 1,159 - - -	Yes; 1446 - - -	Yes; 5,147.
7	Imprisonment, varying terms.	Imprisonment, up to 20 years.	Imprisonment varying from six months to 20 years, and for life.	—	—	—	—	—
8	—	—	—	—	—	—	—	—
9	None required - -	No - - - - -	None in use. Midwife must make a deposition in person, which is accepted, if father cannot attend - - -	Same for the whole of the German Empire.				
10	(*a*) Yes - - - (*b*) Probably - -	(*a*) Only as "trained auxiliary." (*b*) Not known.	Yes - - - - -					
11	—	—	—	—	—	—	—	—
12	No information - -	Not exactly known -	No statistics - - -	Information not available in the precise form asked for.				

SUMMARY—*continued.*

EUROPEAN COUNTRIES—*continued.*

Number of Question.	AUSTRIA-HUNGARY.		ITALY.	RUSSIA.	NORWAY.	SWEDEN.	DENMARK.
	AUSTRIA.	HUNGARY.					
1	Yes. Decree of 1870	No civil registration, but Church authorities keep registers.	Yes. Ordinance of 1865	No	Yes; Memorandum of Board of Trade of 1797.	Yes; Circular of 1860	Yes. Laws of 1871 and 1877.
2	Yes	Yes; by Church authorities.	Yes	No	Yes; by Church authorities	Yes; by parish priests	Yes.
3	Both	As deaths	As births	Neither	Separately from births and deaths.	As births	As "stillbirths" in the column of "deaths."
4	None	None	Children born dead, or with no power to live.	None	A fœtus capable of vitality, but born without life.	None	A child born after the 28th week of gestation as dead, or as apparently dead, and not called back to life.
5	Fine or imprisonment	Fines, as in cases of registration of deaths.	Fines	None	Fines	No special penalties	Fines.
6	Yes; 26,315	Yes; 13,193	Yes; 42,117	No	Yes; 1567	Yes, 3,557	No.
7	Penal servitude, 1 to 10 years.	Imprisonment up to 5 years.	Varying terms of imprisonment.	Penal servitude, 4 to 6 years. Exile to Siberia for the mother if consenting party.	Imprisonment for terms varying from 6 months to 12 years. Death penalty in case mother dies.	Imprisonment from 2 to 6 years.	From 2 months' imprisonment to hard labour for life.
8	—	—	—	—	—	—	—
9	No; the coroner registers	No	No	No registration	Yes	Yes	Yes, if accompanied by medical officer's certificate.
10	Yes	Yes	Yes	(*a.*) Yes. (*b.*) Yes; in the towns, less generally in rural districts.	(*a.*) Yes (*b*) In the towns only.	Yes	Yes.
11	—	—	—	—	—	—	—
12	—	—	—	Information not available in the precise form asked for.			

SUMMARY—*continued.*

Question.	Nova Scotia.	Quebec.	North West Territory.	New Brunswick.	Prince Edward Island.	Ontario.	British Columbia.	Manitoba.
1.	No	No		Yes; as other births	No	Yes	No.	—
2.	No	No		Yes	By the statistical officer appointed for the collection of mortuary statistics.	Yes		The only information given is a reference to the Vital Statistics Act, cap. 149, from which it appears that the law in relation to the registration of stillbirths in Manitoba is almost identical with that in Ontario.
3.	Neither	Neither		Both	Separately from births	Both.	—	
4.	None	None		None	Not known	No.	—	
5.	None	None		As for other births	None	As for other births.	—	
6.	Not known	Not known		Not known	Two	Not known.	—	
7.	Maximum: Penal servitude for life.	Imprisonment for life		Death	Imprisonment ranging from two years to for life.	Imprisonment for life	Imprisonment for life.	
8.	None	None		As for other births		None.	—	
9.	No such certificates	No	No local legislation and no information available.	Yes; as for other births	Yes	Yes.	—	
10.	(*a*) Yes (*b*) Yes	(*a*) Yes (*b*) Probably not		(*a*) (*b*) No	(*a*) Yes (*b*) A considerable portion.	(*a*) No (*b*) No.	(*a*) No. —	
11.	Act relating to the practice of medicine and surgery: "Nothing in this chapter shall prevent any competent female from practising midwifery in Nova Scotia, except that any such female must satisfy the Provincial Medical Board of her competency, and obtain a certificate from the Registrar to that effect before she can lawfully practice, as aforesaid, in the city of Halifax.	Under regulations made by the Provincial Board, and in the country parts, women obtaining certificate from a duly licensed physician certifying that they have the necessary knowledge can practise midwifery.		44 Vict. cap. 19, s. 36: "Nothing in this Act shall be construed to prevent any woman from giving necessary aid in cases of confinement, as heretofore accustomed."	Medical Act, 1892, s. 43: "Nothing in this Act shall be construed to prevent any woman from practising midwifery."		None.	
12.	Not known	Not known		Not known	About 7 per 1,000		Not known.	

SUMMARY—*continued.*

Question	New South Wales.	Victoria.	South Australia.	Queensland.	Western Australia.	Tasmania.	New Zealand.
1.	No	No	No	No	Yes; 19 Vict., cap. 12	No *	No.
2.	No registration allowed	No registration in the strict sense of the word, but deputy-registrars of births and deaths are "recommended" to make a note of all cases that come to their knowledge.	No	No	Yes		No.
3.	Neither	Neither	Neither	Neither	Both		Neither.
4.	The converse of the definition in 46 Vict., No. 17, Sect. 11:—"A child shall be held to have been born alive if it shall have breathed and have been wholly born into the world, whether it had an independent circulation or not."	None	None	None	None		None.
5.	None	None	None	None	Similar to those for other births.		None.
6.	Not known	Not known	Not known	Not known	Yes; 16		Not known.
7.	Procuring abortion, liable to 10 years' imprisonment	Procuring abortion, liable to 15 years' imprisonment.	Minimum, 3 years' hard labour; maximum, imprisonment for life.	Minimum, 2 years' imprisonment; maximum, penal servitude for life.	As for attempting to procure abortion.		No specific provisions, but see "Offences against the Person Act, 1867."
8.	None	None	None	None	No regulations. For form, *see* page 50.		None.
9.	There is no such certificate.	There is no such certificate.	No such certificates	No such certificates	No such certificate		No registration.
10.	(*a*) Midwives not recognised by the State. (*b*) A large proportion in their hands.	Midwives not recognised by law.	No	No; in country places, but not in large towns.	No	(*a*) No	No; probably not.
11.	There are no regulations	No regulations	No regulations	No regulations	No regulations		No regulations.
12	Proportion not known	2·81 (in cases of children born alive).	4·39 (in cases of children born alive).	4·10 (estimated)	Not known		5·5 (for 1890 in cases of children born alive).

* The question of making provision for the compulsory registration of all stillbirths is under consideration in the Colony.

UNITED STATES.

SUMMARY—*continued.*

No. of Question and Reply.	Alabama, City of Mobile.	Arizona.	Arkansas.	California, City of San Francisco.	Colorado.	Columbia.	Connecticut.	Dakota.	Delaware.
1	Yes; municipal ordinance.	No information	No information	Yes; city ordinance	Yes	No information	Yes	No information	Yes; State Law.
2	Yes			Yes	Yes		Yes		Yes.
3	As stillbirths			As stillbirths	As deaths		As births		As stillbirths.
4	One dying before complete separation from the mother.			—	One which has not breathed after birth.		None		Lifeless or dead-born.
5	Fine not exceeding $50.			Same as live children	Fine of from $3 to $100. (Never enforced.)		Fine of from $10 to $25.		Fine, rom $1 to $10.
6	Yes; 114			Yes; 369	109 at Denver		Yes; 649		Yes, 59.
7	Same penalties as for murder.			It is a felony	Imprisonment up to three years; fine up to $1,000.		Fine up to $1,000, or imprisonment up to five years, or both.	Varying terms of imprisonment and fines.	Fines, from $100 to $5,000; imprisonment, one to five years.
8	—			—	—		—	—	—
9	No			Yes	Yes		Yes		Yes.
10	(*a*) No law on the subject. (*b*) Yes			(*a*) Yes (*b*) No	Yes		(*a*) No (*b*) No	No information	(*a*) Yes. (*b*) No.
11	No regulations			Same as physicians	Practically unregulated.		No regulations		—
12	Not known			No records	Not known		Not known		Not known.

UNITED STATES—*continued.*

No. of Question and Reply.	FLORIDA, CITY OF PENSACOLA.	GEORGIA.	IDAHO.	ILLINOIS.	INDIANA.	IOWA.	KANSAS.	KENTUCKY.	LOUISANA, CITY OF NEW ORLEANS.
1	Yes; State Law	No	No	Yes; State Law	Yes; State Law	Yes; State Law	Yes; State Law	Yes; State Law	Yes, for purposes of burial.
2	Yes			Yes	Yes	Yes	Yes	Yes	Yes.
3	As both			As both	As both		As both	As births	As stillbirths.
4	Born dead			Child not living more than 24 hours.	No definition		Dead at moment of delivery.	Any dead-born child after quickening period.	A child that never breathed.
5	—			$10	Fine up to $100; imprisonment up to 90 days.	$10	Same as in case of ordinary death.	Same as in case of ordinary births.	None.
6	33 in Pensacola	Not known		1,491 at Chicago	Yes, 850		Not known	Not known	Yes, 490.
7		Death, or imprisonment for varying terms up to life.	Imprisonment for two to five years.	Imprisonment, 1 to 10 years.	Fines, $50 to $500; imprisonment, 3 to 14 years.	Imprisonment up to 5 years; fine up to $1,000.		No penalty except in case of death of mother.	Penitentiary service.
8	—	—	—	—	—	—	—	—	—
9	Yes			Yes	Yes		Yes	Yes	Yes.
10	(*a*) No (*b*) Yes			(*a*) Yes (*b*) More than half	(*a*) Yes (*b*) No		No	(*a*) — (*b*) Yes	Yes.
11	No regulations			License			No regulations	No regulations	No regulations.
12	N known.	—	—	—	—	—	—	—	—

UNITED STATES—*continued.*

No. of Question and Reply.	MAINE.	MARYLAND.	MASSACHUSSETTS.	MICHIGAN.	MINNESOTA.	MISSISSIPPI.	MISSOURI.	MONTANA.	NEBRASKA.
1	Yes; State Law	No	No	No	Yes; State Law	No information.	Yes: State Law.	—	—
2	Yes	—	Yes	Yes	Yes		Yes.	—	—
3	As both	—	As deaths	As both	As deaths		As both.	—	—
4	—	Child born dead during any period of pregnancy.	—	Never having breathed.	No legal definition		No legal definition.	—	—
5	Fine up to $100	No penalty by Statute Law.	No penalty	Same as in case of deaths.	Same as in cases of death.		Fine of from $10 to $200.	—	—
6	Not known	—	Yes; 2,099	Yes; 1,397	176 at St. Paul		710 at St. Louis.	—	—
7	Imprisonment up to 5 years. Fine up to $1,000.	Imprisonment up to 3 years. Fine from $1,000 to $5,000.	Imprisonment from 1 to 5 years. Fine up to $2,000.	Imprisonment for varying terms.	Penalties as for manslaughter and misdemeanour.		As for manslaughter.	Varying terms of imprisonment.	Imprisonment up to 1 year. Fine up to $500.
8	—	—	—	—	—		—	—	—
9	Yes	—	Yes	Yes	Yes		Yes.	—	—
10	(*a.*) No (*b.*) Not known	(*a.*) No (*b.*) —	(*a.*) Not professionally. (*b.*) No statistics	(*a.*) Yes (*b.*) No.	Yes		Yes.	—	—
11	No regulations.	—	—	—	—		—	—	—
12	—	—	4·6 per cent. in 1890	—	—		—	—	—

UNITED STATES—*continued.*

No. of Question and Reply.	NEVADA.	NEW HAMPSHIRE.	NEW JERSEY.	NEW MEXICO.	NEW YORK STATE.	NEW YORK CITY.	NORTH CAROLINA.	OHIO.	OREGON.	PENNSYLVANIA.
1	No special laws respecting stillbirths or practice of midwives.	Yes; State Law	Yes; State Law	No	No	Yes; State Law	Not generally		No State laws, but generally city ordinances.	No State law.
2		Yes	Yes	No	Yes	Yes	No		Yes	Yes.
3		As both	As stillbirths	As deaths	As neither kept semi-official record of stillbirths.	As stillbirths	As both		As both.	—
4		No definition	One that does not breathe after birth.	Child born dead	One that has never breathed.	One that has never breathed.	None		Child dead before complete detachment from mother.	—
5		Fine up to $100	Fine of $20	None	None	Fine of $10	None		Fine of $10.	—
6		—	Yes; 1,795	—	—	3,315	—		4.	—
7		Fine up to $1,000. Imprisonment up to 10 years.	Death	Imprisonment up to 4 years.	Imprisonment from 5 to 20 years.	Imprisonment from 5 to 20 years.	Imprisonment from 1 to 10 years.	Imprisonment 1 to 7 years.	Imprisonment from 1 to 15 years. Fine up to $5,000.	—
8		—	—	—	—	—	—	—	—	—
9		Yes	Yes	Yes	Yes	Yes	No		No	No laws.
10		(*a*) No (*b*) Not known	(*a*) Yes (*b*) No	(*a*) No (*b*) Yes	No	No	(*a*)— (*b*) Yes.		No	No.
11		No regulations	—	—	—	Must register themselves.	—	—	—	—
12		6 per 1,000 in 1889	—	—	—	7 per 1,000.	—	—	—	—

UNITED STATES—*continued.*

No. of Question and Reply.	Rhode Island.	South Carolina, City of Charleston.	Tennessee.	Texas.	Vermont.	Virginia.	Washington.	West Virginia.	Wisconsin.	Wyoming.
1	Yes: State law	Yes; City ordinance		No	No	Yes	Yes	Yes	Yes.	—
2	Yes	Yes		No	Yes	Yes	Yes	Yes	Yes.	—
3	As both	As births		As deaths	As deaths	As births	As both	As stillbirths.	—	—
4	Fully developed child born dead.			Child absolutely born dead.		Not defined	—	—	—	—
5	Fine up to $20	Fine up to $50; imprisonment up to 30 days.		None	None	$5 fine	$10 fine	$5 fine	Fine from $50 to $100.	—
6	296	208	No information		231 in 1889	Not known	Not known	173.	—	—
7	Imprisonment up to 20 years.			Imprisonment from 2 to 10 years.	Varying terms of imprisonment.	Penalty attaching to felony.	Penal offence	Imprisonment from 3 to 10 years.	Varying terms of imprisonment and fines.	Fine from $800 to $1,000; imprisonment for 1 to 5 years.
8	—	—		—	—	—	—	—	—	—
9	Yes	Yes		Yes	Yes	Not known.	—	—	—	—
10	No	Yes		(*a*) No (*b*) Yes	(*a*) No (*b*) Not known	(*a*) No (*b*) —	(*a*) Yes (*b*) No.	No —	Yes. —	— —
11		No regulations		No regulations	No regulations		No regulations	No regulations.	—	—
12	3·8 per 1,000	—	—	—	—	—	—	—	—	—

GENERAL REPORT of the CONSERVATORS of the RIVER THAMES, from the 1st January 1892 to the 31st December 1892, with ACCOUNTS of MONEYS RECEIVED and EXPENDED by them, for the Year ended 31st December 1892.

GENERAL REPORT of the PROCEEDINGS of the CONSERVATORS of the RIVER THAMES from the 1st January 1892 to the 31st December 1892.

The moorings, steamboat piers, and landing-places and other works in the river were maintained in proper order and repair.

Forty-five sunken vessels were raised by the Conservators' wreck-raising plant during the year. Of these, eight were steam vessels measuring 6,098 tons, two were sailing vessels measuring 415 tons, and 35 were barges measuring 1,405 tons.

During the year two large steam dredgers were continuously employed in improving the navigable channel in the lower reaches of the river.

The dredging barges and punts working under licenses granted by the Conservators were carefully watched with the view of preventing illegal dredging.

The dredging carried out in the river above Teddington by vessels belonging to private owners having attained limits in excess of what the Conservators consider necessary for the improvement of the navigation, the Conservators have felt it incumbent on them to further restrict such dredging in future, and propose to grant licenses for short periods only and in places where it is unquestionable that the navigation will be benefited thereby.

The Explosives Act and the bye-laws made under its provisions were enforced by the harbour masters and other inspectors of explosives. Three convictions for infractions of this Act and bye-laws were obtained during the year.

Where the evidence was sufficient to render convictions probable, legal proceedings were taken by the Conservators against persons navigating vessels in such a manner as to contravene the provisions of the Acts and bye-laws, and 13 convictions were obtained.

The Conservators enforced the provisions of their Acts and bye-laws with respect to sundry offences, and especially with regard to the discharge of rubbish and ashes into the river, and obtained 51 convictions in respect of this offence, which occurred principally on the river below London Bridge.

Fifty-three convictions were also obtained in respect of sundry offences.

The Conservators are gratified to be able to record that there has been a marked improvement in the condition of the water of the river in its lower reaches. The Conservators have for several years past urged upon the late Metropolitan Board of Works, and their successors the London County Council, the importance of preventing the passage of untreated sewage into the river from the outfalls at Barking and Crossness, and the London County Council have adopted a system by which the solid matter, in the form of sludge, is conveyed by vessels to a point below the limits of the jurisdiction of the Conservators. The Conservators trust that their efforts for the purification of the river in its lower reaches, combined with those of the London County Council, will result in the water attaining a satisfactory standard of purity.

Above the western boundary of the Metropolis the Conservators have continued to carry into effect the provisions of the Acts which relate to the discharge of sewage into the river and its tributaries from towns and other places on their banks, and the sewage works established at various towns on the river and its tributaries were very closely watched.

As in previous years, the houseboats and launches on the river, above Teddington, have been closely watched by the Conservators' officers, but they have not been able to discover any case of pollution from these vessels.

A number of Bills in Parliament affecting the river were watched during the Session 1892, and such measures taken as were required to guard the interests of the public in connection with the River Thames.

Great progress has been made in the construction of the works authorised by the Richmond Footbridge, Sluices, Lock, and Slipway Act, 1890, and, although the Conservators were hindered by floods and frosts in the winter months, they trust it will be possible to open the works for the use of the public before the end of the year 1893.

The Conservators have had under consideration the bye-laws regulating the fishery in the Thames, and representations have been made to them by the various Thames Angling Associations and by professional fishermen on the river.

These representations have been laid before the Counsel referred to in the Conservators' Report to Parliament for 1890, and he has completed a draft

of

of the proposed new bye-laws, which has now been submitted for the allowance of Her Majesty in Council. The Conservators trust that before long these bye-laws will come into operation, and will tend to the improvement of the fishery in the river.

UPPER NAVIGATION.—BETWEEN STAINES AND CRICKLADE.

The locks, weirs, and tow-paths have been maintained in an efficient state.

The Conservators referred in their Report for 1890 to an arrangement entered into with the Thames Valley Drainage Commissioners before a House of Commons Committee as to the expenditure of part of the Conservators' funds on the river above Long Wittenham, and last year the Conservators stated they were proceeding with the works above Oxford. They are gratified to be able to state that they have completed part of those works, and that a new lock and weir at Radcot are open, and that considerable benefit has thereby accrued both to the navigation and to lands adjoining in that part of the river.

The construction of the new lock and weir at Northmoor will be proceeded with as expeditiously as the Conservators' funds will admit of.

Cookham Lock has been lengthened, and a boat-slide has been placed there for the greater accommodation of the large amount of boat traffic which passes that lock.

The Conservators have found it desirable to make restrictions with regard to dredging punts in this part of the river, similar to those which they have made in the river between Staines and Teddington.

F. W. E. Nicolson, Deputy Chairman.
James H. Gough, Secretary.

Thames Conservancy,
10 July 1893.

THAMES CONSERVANCY.—LOWER NAVIGATION.

AN ACCOUNT of MONEYS Received and Expended by the Conservators of the River Thames, for the Year ended 31st December 1892.

RECEIPTS.

	£. s. d.	Less Amount payable to H.M. Commissioners of Woods and Forests, proportion of Receipts, 1892. £. s. d.	£. s. d.	£. s. d.
Balance, 31st December 1891	10,172 – 5			
Less,—Amount paid to H.M. Commissioners of Woods and Forests: Proportion of Receipts, 1892	4,373 4 9	– –	– – –	5,798 15 8
Tonnage Dues	– –	– –	46,082 8 –	
Tolls:				
Barge	7,617 9 1			
Pleasure	1,814 18 6	– –	9,432 7 7	
Water Companies	1,450 – –			
Canal Companies	1,050 – –	– –	2,500 – –	
Pier Dues	6,127 1 9	210 – –	5,917 1 9	
Rents for Accommodations	9,453 19 11	3,256 17 11	6,197 2 –	
Rents for Accommodations above Teddington	113 15 9	11 17 4	101 18 5	
Other Rents	462 1 10	7 6 8	454 19 2	
Fines for Accommodations	863 – –	287 13 4	575 6 8	
Southern Thames Embankment: Proportion of amount invested in 1869, pending settlement of the question of title to the foreshore	1,161 13 10	395 3 11	766 9 11	
Maintenance of Moorings	695 – –	17 – –	678 – –	
Ballast Licenses:				
Westward of London Bridge	362 – –	} 500 – –	804 10 11	
Eastward of London Bridge	942 10 11			
		4,685 19 2		

EXPENDITURE.

	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Interest of Debt			3,314 10 –	
Mooring Service			9,683 3 1	
Wreck Service			2,228 2 1	
Dredging below Bridge			11,819 13 1	
Causeways, Foreshores, Beacons, and Tidal Observations			730 8 6	
Harbour Service			7,382 14 5	
Dredging above Bridge			1,386 1 3	
Locks, Weirs, Towing-paths, and Banks			4,037 4 10	
Notice Boards	128 11 4			
Bye-laws and Boat Plates	86 7 10		214 19 2	
Inspection above Bridge			1,468 9 1	
Piers, Wages to Staff	5,036 14 6			
„ Repairs and Renewals	4,369 17 10		9,406 12 4	
Law Expenses: Solicitor and Staff (proportion)	902 8 5			
Other Law Charges	809 1 7			
Less,—Amount charged to H. M. Commissioners of Woods and Forests, as below	129 6 2			
	679 15 5		1,582 3 10	
Parliamentary Expenses			695 7 –	
Allowance to the Conservators			2,400 – –	
Elections of Conservators			127 3 10	
Travelling Expenses on Surveys			96 18 4	

	£. s. d.	£. s. d.	£. s. d.
Sale of Ballast		17 4 11	
Explosive Licenses		68 – –	
Registration and other Fees:			
Houseboat	248 4 –		
Pleasure Boat	50 14 1		
Launch	74 7 6		
Sundry, including Weir Permits	24 5 11		
		397 11 6	
Dividends on Stocks		1,829 17 –	
Interest on Loans to Upper Fund		13 1 7	
Penalties and Costs		389 19 7	
Assessors' Fees		284 – 6	
Raising Wrecks		1,605 7 2	
Loan of Craft		1,613 – –	
Craft Renewal and Insurance Fund		272 11 4	
Amounts repaid (*see* contra)	1,626 2 11		
Ditto – Tower Bridge Works (*see* contra)	657 12 4		
		2,283 15 3	
Sale of Land		5 – –	
			82,289 9 3
		£.	88,088 4 11

	£. s. d.	£. s. d.	£. s. d.
Secretary and Staff		4,846 15 3	
Engineer and Staff		3,951 7 6	
Office Expenses, including Stationery and Printing		1,785 2 10	
Collection of Dues, including Lock-keepers' Wages		1,952 5 5	
Donations, Expenses, and Compensations		457 4 4	
Pensions and Gratuities		2,378 16 7	
Assessor's Fees		291 7 6	
Amounts to be repaid (*see* contra)	1,135 3 8		
„ Tower Bridge Works (*see* contra)	692 11 10		
		1,827 15 6	
Purchase of Stock		1,154 14 3	
Income Tax		17 4 2	
On account of New Offices on the Thames Embankment		1,662 11 6	
On account of Works in course of construction under the Richmond Footbridge, Sluices, Lock and Slipway Act, 1890		6,000 – –	
Balance		9,733 4 10	
Less,—Amount payable to H. M. Commissioners of Woods and Forests: Proportion of Receipts, 1892 (*see* contra)	4,685 19 2		
Deduct,—Amount charged to Commissioners, as above	129 6 2		
Deduct,—Income Tax	12 17 5		
	142 3 7		
		4,543 15 7	
			5,189 9 3
		£.	88,088 4 11

We hereby certify that the above is a correct Account of Receipts and Application of Moneys which have been received by the Conservators of the River Thames, for the Year ended 31st December 1892.

F. W. E. Nicolson, Deputy Chairman.
James H. Gough, Secretary.

CAPITAL ACCOUNT, 31st December 1892.

	£. s. d.	£. s. d.
Amount borrowed on the Security of Tolls on the Navigation of the River Thames, westward of London Bridge	94,700 – –	
Amount of 2 *l.* 15 *s.* Consols:		
Account "A"		59,440 10 5
Account "B," Craft Renewal and Insurance Fund		10,000 – –
	£. 94,700 – –	£. 69,440 10 5

28 April 1893.

Examined and approved,
T. J. Begent, Auditor.

THAMES CONSERVANCY.—UPPER NAVIGATION.

AN ACCOUNT of Moneys Received and Expended by the Conservators of the River Thames, for the Year ended 31st December 1892.

RECEIPTS.	£. s. d.	Revenue. £. s. d.	Total. £. s. d.
Water Companies		16,665 – –	
Tolls:			
Barge	1,114 13 4		
Pleasure	4,462 12 10	5,577 6 2	
Registration and other Fees:			
Houseboat	1,080 18 –		
Pleasure Boat	228 3 5		
Launch	334 12 6		
Sundry, including Weir Permits	49 2 1	1,692 16 –	
Ballast Licenses	104 5 –		
Sale of Ballast	520 7 6	624 12 6	
Rents		77 17 –	
Penalties and Costs		33 – 6	
Amounts repaid (*see* contra)		193 3 2	
			24,863 15 4
Balance			3,622 3 7
		£.	28,485 18 11

EXPENDITURE.	£. s. d.	Revenue. £. s. d.	Capital. £. s. d.	Total. £. s. d.
Balance, 31st December 1891		—	—	1,778 13 10
Bank of England, part Repayment of Loan of 100,000 *l.*		2,342 8 –	—	
„ „ Interest on ditto		3,385 13 2	—	
Building and Repairing Locks		1,196 16 7	6,307 12 9	
„ „ Weirs		1,020 17 3	2,462 3 7	
Dredging and removing Obstructions		1,540 16 8	—	
Repairing Tow-paths and Banks		1,385 9 9	276 19 3	
Tow-path Rents		138 13 7	—	
Plant and Repairs		157 3 6	35 1 3	
Law Expenses:	£. s. d.			
Solicitor and Staff (proportion)	525 13 10			
Other Law Charges	103 16 1			
	629 9 11			
Less amount received in repayment of charges in previous years	368 3 –			
		261 6 11	—	
Parliamentary Expenses		877 14 10	—	
Allowance to the Conservators		700 – –	—	
Election of ditto		14 18 6	—	
Travelling Expenses		90 11 –	—	
Inspectors' Salaries and Expenses, including Analyses and other Expenses *re* Pollution		1,224 11 3	—	
Survey of River		42 15 –	—	
Lock-keepers and Ferrymen		2,070 18 7	—	
	£. s. d.			
Notice Boards	38 9 9			
Bye-Laws and Boat Plates	194 17 –			
		233 6 9	—	
Regattas		167 6 4	—	
Stationery and Advertisements		36 16 5	—	
Compensations under Thames Navigation Act, 1866, and other Expenses		190 12 4	—	
Pensions and Gratuities		316 17 5	—	
Amounts to be repaid (*see* contra)		216 12 10	—	
Interest on Loan from Lower Fund		13 1 7	—	
	£.	17,625 8 3	9,081 16 10	26,707 5 1
				28,485 18 11

We hereby certify that the above is a correct Account of Receipts and Application of Moneys which have been received by the Conservators of the River Thames, for the Year ended 31st December 1892.

F. W. E. Nicolson, Deputy Chairman.
James H. Gough, Secretary.

28 April 1893.

Examined and approved,
T. J. Begent, Auditor.

STATEMENT of EXPENDITURE on CAPITAL ACCOUNT from 6th August 1866 to 31st December 1892.

	£. s. d.	£. s. d.	£. s. d.
Amount Expended to 31st December 1891, as per previous Statement - - - - - - - - -	- - -	- - -	167,974 10 7
Particulars of the Expenditure for the Year 1892 :—			
New Lock at Radcot (further payment) - - -	2,204 2 9		
Ditto at Northmoor (further payment) - - -	1,136 13 11		
Boat Slide at Eynsham Weir - - - - -	78 19 –		
Cookham Lock - - - - - - - - -	1,780 12 –		
Marlow Lock (further payment) - - - - -	702 15 6		
Boat Slide at Cookham Lock - - - - -	404 9 7		
		6,307 12 9	
New Weir at Radcot (further payment) - - - -	728 16 11		
Abingdon Weir - - - - - - - - -	566 2 8		
Whitchurch Weir (further payment) - - - -	33 9 6		
Boveney Weir (further payment) - - - - -	467 16 6		
Crowmarsh Weir - - - - - - - -	665 18 –		
		2,462 3 7	
Gatehampton Ferry Cottage (further payment) - -	266 2 9		
Campshedding Land at Gatehampton - - - -	10 16 6		
		276 19 3	
Plant - - - - - - - - - - - -	- - -	35 1 3	
			9,081 16 10
		£.	177,056 7 5

Note.—No charge has ever been made to the Upper Navigation for Salaries and Expenses of the Secretary's Staff, Engineer's Office Staff, and the Expenses of the Chief Office.

28 April 1893.

Examined and approved,
T. J. Begent, Auditor.

THAMES CONSERVANCY.

GENERAL REPORT of the CONSERVATORS of the RIVER THAMES, from 1st January 1892 to 31st December 1892, with ACCOUNTS of MONEYS RECEIVED and EXPENDED by them, for the Year ended 31st December 1892.

(*Presented pursuant to Act* 20 & 21 *Vict.* (*L.&P.*) *c.*147, *s.*163.)

Ordered, by The House of Commons, *to be Printed,*
18 *July* 1893.

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341. *Under* 1 *oz.*

RETURN to an Order of the Honourable The House of Commons, dated 19 December 1893;—*for*,

RETURN "showing the Number of COLLISIONS which have been reported to the Board of Trade, in conformity with the Provisions of the Merchant Shipping Acts, as having occurred in the River Thames, above Gravesend, during each of the Five Years ended the 30th day of June 1893; showing also the Number of Vessels Totally Lost, and the Number of Lives Lost by such Collisions."

Board of Trade, 19 December 1893.

COURTENAY BOYLE, *Secretary.*

RETURN showing the Number of COLLISIONS which have been reported to the Board of Trade, in conformity with the Provisions of the Merchant Shipping Acts, as having occurred in the River Thames, above Gravesend, during each of the Five Years ended the 30th day of June 1893; showing also the Number of Vessels Totally Lost, and the Number of Lives Lost by such Collisions.

YEAR.	Number of Collisions.	Number of Vessels Totally Lost.	Number of Lives Lost.
1888-89 - - - - -	499	11	14
1889-90 - - - - -	510	7	7
1890-91 - - - - -	515	7	7
1891-92 - - - - -	368	9	11
1892-93 - - - - -	485	9	5
TOTAL - - -	2,377	43	44

Marine Department.

Ingram B. Walker, Assistant Secretary.

RIVER THAMES (COLLISIONS).

RETURN showing the Number of COLLISIONS which have been reported to the Board of Trade, in conformity with the Provisions of the Merchant Shipping Acts, as having occurred in the River Thames, above Gavesend, during each of the Five Years ended the 30th day of June 1893, showing also the Number of Vessels Totally Lost, and the Number of Lives Lost by such Collisions.

(*Mr. Macdona.*)

Ordered, by The House of Commons, *to be Printed,*
28 *December* 1893.

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90, West Nile-street, Glasgow; or
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[*Price* ½ *d.*]

468.

RETURN

To an Order of the Honourable The House of Commons, dated 29 November 1893;—

for,

"COPY of Circular Letter addressed by the Local Government Board on the 30th September 1893, to Sanitary Authorities in England and Wales, with reference to means which may be adopted for providing, in times of exceptional distress, Employment for the Unemployed."

Local Government Board,
29th November 1893.

HUGH OWEN,
Secretary.

(*Mr. H. H. Fowler.*)

Ordered, by The House of Commons, *to be Printed,*
30 *November* 1893.

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JOHN MENZIES & Co., 12, Hanover Street, Edinburgh, and
90, West Nile Street, Glasgow; or
HODGES, FIGGIS, & Co., Limited, 104, Grafton Street, Dublin.

Unemployed.

LOCAL GOVERNMENT BOARD, WHITEHALL, S.W.,
30th September, 1893.

SIR,

I AM directed by the Local Government Board to state that, having regard to the scarcity of employment which now exists in many parts of the country, and to the great probability of this becoming more general and being intensified during the winter months, the Board deem it right to bring under the special attention of the Sanitary Authority the Board's Circular Letters of the 20th March 1886 and the 14th of November of last year, with reference to means which may be adopted for providing, in times of exceptional distress, employment for the unemployed of a class who do not ordinarily have recourse to Boards of Guardians for relief.

The Board feel assured that the Sanitary Authority will concur with them in their view as to the great importance of aiding artisans and others who make great personal sacrifices in order to avoid the stigma of pauperism, to maintain their independence. This can best be secured by the local authorities proceeding with the execution of the works which, in the interest of their district as regards its sanitary condition or local improvement, or otherwise, it is desirable should be carried out, at the time when other employment is difficult to obtain.

What is required in the endeavour to relieve artisans and others who have hitherto avoided poor law assistance, and who are temporarily deprived of employment, is:—

1. Work which will not involve the stigma of pauperism;
2. Work which all can perform, whatever may have been their previous avocations;
3. Work which does not compete with that of other labourers at present in employment; and

Lastly, work which is not likely to interfere with the resumption of regular employment in their own trades by those who seek it.

These works may be of the following kinds, among others:—

Spade husbandry on sewage farms.

Laying out of open spaces, recreation grounds, new cemeteries, or disused burial grounds.

Cleansing of streets not usually undertaken by local authorities.

Laying out and paving of new streets, &c.

Paving of unpaved streets, and making of footpaths in country roads.

Providing or extending sewerage works and works of water supply.

The Board strongly urge the Authority to mature any schemes for works required for their district as early as possible, so that the commencement of the works may be expedited, and assistance may thus be rendered to the unemployed of the class referred to. Some time must necessarily elapse before works which are proposed can be commenced, and the Board trust therefore that there will be no delay on the part of the Authority in determining as to any works to be executed by them.

As the Board have previously stated, they recommend that there should be co-operation between Sanitary Authorities and Boards of Guardians, and

that arrangements should be made as far as practicable for the employment in connection with the works, of those who are recommended by the Guardians as persons who, owing to their previous condition and circumstances, it is desirable should not become subjects of poor law relief.

When the works undertaken are of such a character that the expense may properly be defrayed out of borrowed moneys, the Sanitary Authority may rely that there will be every desire on the part of the Board to deal promptly with the applications which may be made to them for their sanction to loans.

The Board will be obliged by being informed from time to time of any means which may be adopted by the Authority of affording assistance to the unemployed, as suggested in this communication.

I am, Sir,

Your obedient Servant,

(Signed) HUGH OWEN,

Secretary.

The Clerk to the Sanitary Authority.

RETURN

To an Order of the Honourable The House of Commons, dated 29 November 1893;—

for,

COPY of Circular Letter addressed by the Local Government Board, on the 30th September, 1893, to Sanitary Authorities in England and Wales, with reference to means which may be adopted for providing, in times of exceptional distress, Employment for the Unemployed.

Local Government Board, 29th November 1893.

HUGH OWEN, *Secretary.*

(*Mr. H. H. Fowler.*)

Ordered, by The House of Commons, *to be Printed,* 30 *November* 1893.

[*Price* 1 *d.*]

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VACCINATION (PUBLIC DEPARTMENTS).

RETURN to an Order of the Honourable The House of Commons, dated 13 July 1893;—*for*,

"RETURN of all DEPARTMENTS of the GOVERNMENT in which there is in force any REGULATION making VACCINATION or RE-VACCINATION a Condition precedent, in default of which any Person, who is otherwise in all respects qualified, is precluded and rejected from entering the SERVICE of the STATE, and giving the following Particulars, viz.:—

(1.) Department or Service, and Grades in the same, to which such Regulation is applicable;

(2.) The Text of the Regulation;

(3.) When Passed or Ordered."

Treasury Chambers, 8 September 1893.

JOHN T. HIBBERT.

(*Mr. Hopwood.*)

Ordered, by The House of Commons, *to be Printed*, 9 *September* 1893.

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RETURN of all DEPARTMENTS of the GOVERNMENT in which there is in force any REGULATION making VACCINATION or RE-VACCINATION a Condition precedent, in default of which any Person, who is otherwise in all respects qualified, is precluded and rejected from entering the SERVICE of the STATE, and giving the following Particulars, viz.:—(1.) Department or Service, and Grades in the same, to which such Regulation is applicable; (2.) The Text of the Regulation; (3.) When Passed or Ordered.

1. ADMIRALTY.

RETURN of all Regulations in force relating to Vaccination or Re-vaccination of Persons entered for Employment in the Royal Navy, Royal Marines, and other Departments of the Public Service under the Admiralty.

(1.) Department or Service, and Grades in the same, to which such Regulation is applicable.	(2.) The Text of the Regulation.	(3.) When Passed or Ordered.
Officers, men, and boys of all grades, entered in the Royal Navy and Royal Marines.	1. All persons entering the Service are to be re-vaccinated; should no result follow on the first operation, a second vaccination is invariably to be performed. 2. All persons who have not been re-vaccinated between their first entry into the Service and the age of 18 shall be re-vaccinated as soon as possible, however good their primary vaccination cicatrices may appear, or even should they present unmistakable evidence of having suffered from small-pox previous to that age.	Now embodied in Article 1157 of the Queen's Regulations, 1893; but originally ordered by Circular dated 7th March 1871. Also by Admiralty Order dated 26th September 1865 in regard to recruits joining the Royal Marine Depôt at Walmer.
Engineer students - - -	All candidates at the time of their medical examination (for entry) must produce certificates to the satisfaction of the examining officers that they have been re-vaccinated, or they must be re-vaccinated before they can be considered eligible for entry in the Dockyard.	Special rule included in the Regulations for entry, and also in Article 7, page 70, of the Dockyard Instructions, 1882.
Officers and men of the Royal Naval Reserve.	Would be subject to the same rules as for officers and men in the Royal Navy when serving in the Fleet.	—
Admiralty: Departments in London.	No regulation in force.	—
Her Majesty's Dockyards: apprentices to shipwrights, fitters, and other trades.	All candidates must produce certificates to the satisfaction of the examining medical officer (on entry) that they have been re-vaccinated, or they must be re-vaccinated before they can be considered eligible for entry in the Dockyards.	Admiralty Order, 1st March 1890, amending the rule contained in Article 18, paragraph 3, page 80, of the Dockyard Instructions.
Her Majesty's Victualling Yards: apprentices.	All candidates must produce certificates to the satisfaction of the examining medical officer that they have been re-vaccinated, or they must be re-vaccinated before they can be considered eligible for entry into the Yard.	Instructions for Victualling Yards, 1st May 1890.
Her Majesty's Naval Hospitals: civilians.	No regulation in force.	—
Naval Ordnance Store Department: civilians.	No regulation in force.	—

2. CUSTOMS.

Department, Office, or Service.	Text of Regulation.	When Passed or Ordered.	By what Law or Authority.	Explanations. *a.* Whether applicable to all Grades. *b.* Whether any Exceptions are allowed. *c.* Who can dispense with it.
Out-door Department.	Questions to be answered by Candidate.			
	Have you had the small-pox?	—	—	—
	When were you last vaccinated?*	—	—	—
	Question to be answered by Medical Examiner.			
	Has the candidate been satisfactorily vaccinated within the last seven years?*	—	—	—
	* It is understood that any candidate who has not complied with this condition, or who declines to comply with it, will be refused admission to probation by the Board of Customs.			
	"My Lords accordingly authorise you (*i.e.*, the Commissioners of Customs) to refuse to admit to probation any person hereafter appointed to situations in the Out-door Department who has not been successfully vaccinated within seven years previous to such appointment, and who declines to be re-vaccinated."	26 Aug. 1881	Treasury authority.	*a.* Applicable to all grades when placed on probation on first entry to the Service in the Out-door Department. *b.* No exceptions are allowed.

3. INLAND REVENUE DEPARTMENT.

(3115 S.—93.)

Inland Revenue, Somerset House, W.C.,
31 July 1893.

May it please your Lordships,

In answer to Sir J. T. Hibbert's Circular Letter of the 26th instant, No. 11,287, we beg leave to state that although there is no formal regulation existing in this Department as to vaccination, we have nevertheless been in the habit for many years (quite 30) of requiring all the boys who enter the Stamping Department, boys of under 14 years of age, to be vaccinated by our Medical Officer, Dr. Vine, in the instances in which the previous vaccination does not appear to him to be sufficiently protective. A record is kept of such vaccinations in our Stamping Department.

In the case of other candidates for employment referred to Dr. Vine, at the instance of the Civil Service Commissioners, it is his invariable practice, on examination, to inquire of the candidates whether they have been vaccinated, and to so state on the certificate given by him.

But

But with regard to officials generally who enter our service after open competition it is the province of the Civil Service Commissioners to satisfy themselves, before issuing their certificate of qualification, as to the state of the health of the candidates.

We have, &c.
(signed) *A. Milner.*
F. L. Robinson.

To the Lords Commissioners of
Her Majesty's Treasury.

4. IRISH DEPARTMENTS.

Department or Service, and Grades in the same, to which such Regulation is applicable.	The Text of the Regulation.	When Passed or Ordered.
Dublin Metropolitan Police recruits.	The candidate, when he attends for examination, must produce a certificate of his having been properly re-vaccinated.	In the year 1878.
Regulation applicable to recruits for service in Royal Irish Constabulary.	Sections 1469 and 1921 of Code:— 1469. *Vaccination.*—No candidate for the force can be accepted who has not been vaccinated. 1921. *Re-vaccination of Recruits.*—As it is found that the present practice of re-vaccinating recruits after they join the force causes inconvenience and delay, it is directed that when candidates are registered in the first class they should at once have themselves re-vaccinated.	Original Order dated 29th February 1872; Section 1921, above, dated 6th June 1891.
The Department of National Education in Ireland; but only in respect to the Queen's Scholars of the Marlborough Street Training College and the Albert Agricultural Training Institution, Glasnevin, which are under the management of the Commissioners of National Education.	All candidates for admission to the Marlborough Street Training College must produce "medical certificates that they are in good health, and free from any cutaneous disease, and that they either have had the small-pox, or been vaccinated." Similarly for Albert Agricultural Institution:—"Candidates seeking admission to the institution should either have had the small-pox or have been successfully vaccinated."*	The regulation relating to vaccination was first introduced into the rules of the Commissioners in the year 1863.—(Eleventh Code.)

* *Note.*—There are several offices under the Commissioners of National Education the candidates for which are required to undergo medical examination before appointment. The examination, it is presumed, takes account of vaccination, but the Commissioners' Regulations do not specifically require it.

5. METROPOLITAN POLICE.

(V. 20,736—2.)

Sir, New Scotland Yard, S.W., 3 August 1893.

With reference to your letter of the 31st ultimo, requesting information for a Return to an Order of the House of Commons respecting the vaccination of persons entering the Public Service, I have the honour to acquaint you, for the information of the Secretary of State, that vaccination is not included amongst the conditions of service in the Metropolitan Police; but there is an Order, which will be found in Consolidated Orders, page 17, paragraph 28, directing that "All candidates must be vaccinated by the police "surgeon before being posted to a division."

I am, &c.
(signed) *E. R. C. Bradford.*

The Under Secretary of State,
&c. &c. &c.
Home Office.

6. POST OFFICE.

Department or Service, and Grades in the same, to which such Regulation is applicable.	The Text of the Regulation.	When Passed or Ordered.
Post Office : all grades - -	No candidate will be admitted to employment who does not exhibit good marks of primary and secondary vaccination, or good marks of vaccination with definite evidence of having had small-pox.	May 1863. [The terms of the regulation, however, have, since its first establishment, been slightly varied and now stand as in Column 2.]

7. PRISONS DEPARTMENT.

(V. 20,736.—4.)

Home Office, Whitehall, S.W.,
14 August 1893.

Sir,

I HAVE the honour to acknowledge the receipt of your letter of the 31st ultimo, respecting the vaccination of persons entering the Prison Service, and, in compliance therewith, to forward a return showing the regulations as regards Convict Prisons. In the case of Local Prisons, although no regulations are formulated, information is always required whether the candidates have been vaccinated, and the Commissioners hold themselves entitled to require vaccination, if they think fit, if not already performed, or to prefer candidates who have been vaccinated.

I am, &c.
(signed) *E. Du Cane.*

The Under Secretary of State for the Home Department.

RETURN of the Regulations enforced regarding Vaccination in the Convict Prison Service.

Department.	Text of Regulation.	Date.
Convict Prisons - -	All officers are held responsible that they and their families are vaccinated according to law, and on appointment are not to be allowed to occupy public quarters or to enter on their duties until this requirement has been satisfied.	1886.

8. SCOTCH PRISONS DEPARTMENT.

Prison Commission for Scotland, Edinburgh,
12 August 1893.

Sir,

WITH reference to your request, dated the 5th instant, for the preparation of a return, so far as the Department of the Prison Commissioners is concerned, relating to the conditions of appointment in regard to vaccination, the Commissioners have the honour to state that no regulation making vaccination an absolute condition for an appointment has been made by them. But in the Medical Report on Candidates for Office (which is a form approved by the Civil Service Commissioners) the examining medical officer is required to state if the candidate has been satisfactorily vaccinated. If, as is very rarely the case, the medical officer has thought the vaccination marks unsatisfactory it has been suggested to the candidate that he should be re-vaccinated, and no difficulty has ever been met with on the point.

I am, &c.
(signed) *A. B. M'Hardy.*

The Under Secretary for Scotland.

9. WAR OFFICE.

(35,530—1.)

War Office, Pall Mall, S.W.,
31 August 1893.

Sir,

With reference to your letter of the 26th July, No. 11,287—93, transmitting a copy of an Order of the House of Commons, dated 13th July, for a Return of all Government Departments in which there are regulations in force as to the vaccination of persons wishing to enter the service of the State, I am directed by Mr. Campbell-Bannerman to furnish the following statement for the information of the Lords Commissioners of Her Majesty's Treasury.

(1.) The regulations for the vaccination of recruits for the Regular Army and the Militia are contained in paragraphs 843, 844, and 845 of the Medical Regulations, 1890, and are as follows:—

Recruit.

"843. Every recruit, except those bearing distinct marks of small-pox, will be "vaccinated at the depôt of the corps to which he belongs, unless the operation is "certified to have been already successfully performed subsequently to his enlistment, "or, in the case of a recruit joining from the Militia, during his service in that force; "and the officer in medical charge of such depôt will be responsible that this is done, "and that the necessary information regarding vaccination or re-vaccination is recorded "in the soldier's medical history sheet (Army Form B. 178) and in the vaccination register "(Army Book 28).

Repetition unnecessary.

"844. When a man has been successfully vaccinated or re-vaccinated on or after "his entry into the service, it will not be necessary to repeat the operation at any "subsequent time during his period of service with the colours.

Militia recruit

"845. In the case of Militia recruits it will only be necessary to vaccinate or re-"vaccinate such of them as do not bear distinct marks of small-pox or vaccination."

The original orders for the re-vaccination of recruits appear to have been issued by circular letters from the Director General of the Medical Department, dated, respectively, 31st May and 21st September 1858.

(2.) No regulations or instructions on this subject are in force in the Ordnance Factories, but it has been the custom for many years for the medical officer to examine all boy candidates for employment for marks of vaccination, and, where none are present, to cause the boy to be vaccinated.

(3.) There are no written regulations in the Army Clothing Department as to vaccination. All persons before employment are required to be examined by the medical officer, and it is left to his discretion whether they shall be vaccinated or re-vaccinated.

(4.) There are no orders as to vaccination in the regulations for Ordnance Store Services.

I am, &c.
(signed) *H. T. De la Bère.*

The Secretary to the Treasury, Whitehall.

VACCINATION
(PUBLIC DEPARTMENTS).

RETURN of all DEPARTMENTS of the GOVERNMENT in which there is in force any REGULATION making VACCINATION or RE-VACCINATION a Condition precedent, in default of which any Person, who is otherwise in all respects qualified, is precluded and rejected from entering the SERVICE of the STATE, and giving the following Particulars, viz. :—(1.) Department or Service, and Grades in the same, to which such Regulation is applicable ; (2.) The Text of the Regulation ; (3.) When Passed or Ordered.

(*Mr. Hopwood.*)

Ordered, by The House of Commons, *to be Printed,*
9 *September* 1893.

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COLLIERY ACCIDENT FUNDS (GREAT BRITAIN).

RETURN to an Address of the Honourable The House of Commons, dated 10 April 1893;—*for*,

"RETURN setting forth the following Particulars in relation to the COLLIERY ACCIDENT FUNDS in *Great Britain*, which have been raised by Public Subscription for the Relief of Miners' Widows and Children: (1) the Number and the Date of the Foundation of these Funds; (2) the Amount of Surplus in each Fund; (3) the Number of Persons at present receiving Relief from these Funds; (4) the Number of Persons receiving Relief who have been receiving Relief from the Date of the Foundation of each Fund; and (5) the Number of Persons now receiving Relief who have become Recipients since the Foundation of each Fund."

Home Office,
2 August 1893.

HERBERT J. GLADSTONE.

(*Mr. John Wilson—Durham.*)

Ordered, by The House of Commons, *to be Printed*,
3 *August* 1893.

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RETURN setting forth the following Particulars in relation to the COLLIERY ACCIDENT FUNDS in *Great Britain*, which have been raised by Public Subscription for the Relief of Miners' Widows and Children: (1) the Number and the Date of the Foundation of these Funds; (2) the Amount of Surplus in each Fund; (3) the Number of Persons at present receiving Relief from these Funds; (4) the Number of Persons receiving Relief who have been receiving Relief from the Date of the Foundation of each Fund; and (5) the Number of Persons now receiving Relief who have become Recipients since the Foundation of each Fund.

Eastern District of Scotland.

NAME OF FUND.	Date of Foundation.	Amount of Surplus.	Number of Persons at present receiving Relief.	Number of Persons receiving Relief who have been receiving Relief from the Date of the Foundation of the Fund.	Number of Persons now receiving Relief who have become Recipients since the Foundation of each Fund.
		£. s. d.			
Hartley Surplus Relief Fund*	3 September 1863	2,189 14 3	none	none	none.
Udston Colliery Accident Fund	3 June 1887	none	73 (Including 17 widows, and 48 children under 13.)	69	4
Mauricewood Pit Disaster Relief Fund.	5 February 1890	none	116	102	14
TOTAL		2,189 14 3	189	171	18

West Scotland District.

Hartley Surplus Relief Fund *†	1863	2,293 2 4	none	none	none.
Blantyre Colliery Accident Fund	November 1877	none	79 Consisting of 38 widows and 41 other adults.	64	15
Kilsyth Barrwood Colliery Accident Fund.	14 March 1878	800 (Estimated surplus.)	7	4	3
TOTAL		3,093 2 4	86	68	18

Newcastle District.

Hartley Colliery Relief Fund *	January 1862	24,016 1 1 Balance in hand; but not available until the trust expires.	66	10 widows.	56
St. Helens Colliery Explosion Relief Fund.	19 April 1888	4,515 5 3‡ Balance in hand; but it is estimated that all will be absorbed in 14 years from formation.	72	72	none.
TOTAL		28,531 6 4	138	82	56

Durham District.

Pelton	November 1866	120	1	1	—
Seaham	October 1871	57 11 7	3	3	—
Ditto	September 1880	4,134 12 4	50	43	7
TOTAL		4,312 3 11	54	47	7

Yorkshire and Lincolnshire District.

Oaks Colliery Explosion Relief Fund.	December 1866	25,000	77	28	49
Swaithe Main Colliery	December 1875	none §	3	3	none.
TOTAL		25,000	80	31	49

* See Minutes of Evidence, Question 1.
† From such permanent investments this fund was a sum of 500*l.* in 1879 to the sufferers from the Barrwood explosion.
‡ The figures given above are up to 30th June 1892, the date of last balance sheet.
§ It was closed in 1889, when there were six widows still on the fund; these six were taken on the Oaks' Fund; three have since died, and the Swaithe Main Colliery has contributed [illegible] to the Oaks' Fund.

Manchester District.

NAME OF FUND.	Date of Foundation.	Amount of Surplus.	Number of Persons at present receiving Relief.	Number of Persons receiving Relief who have been receiving Relief from the Date of the Foundation of the Fund.	Number of Persons now receiving Relief who have become Recipients since the Foundation of each Fund.
Manchester and Salford Clifton Hall Colliery Explosion Fund.*	June 1885	£. s. d. Still being distributed, and it is not expected that there will be any surplus.	113	59	54
Altham Colliery Explosion Relief Fund.	7 November 1883	It is not expected that there will be any.	67 21 widows; 46 children.	67	none.
TOTAL	-	-	180	126	54

Liverpool District.

Haydock Colliery Explosion Fund	7 June 1878	6,381 – – When amount was actuarily ascertained in 1891.	27	25	2

Midland District.

The Baddesley Colliery Explosion Relief Fund.	8 May 1882	3,284 9 6 Balance in hand, 22nd April 1893.	18	13	5 posthumous children.
Clay Cross Colliery Explosion Relief Fund.	November 1882	4,662 16 3 Balance, 1892.	35 13 widows; 22 children (including two imbeciles).	32 13 widows; 19 children.	3 children, born shortly after the accident.
The Hartley Colliery Relief Fund	About January 1862 a serious disaster occurred at the Hartley Colliery, in the north of England, by which a large number of lives were lost. The sympathy of the public was aroused, and a sum of about 86,000*l.* was raised for the sufferers. The trustees, on finding that this sum would more than meet the requirements, arranged to redistribute about 20,000*l.* to the 12 mining inspection districts in the Kingdom, so "that the same might be applied to the suffering occasioned by colliery accidents in the way which may appear to them most desirable; and that, whilst leaving the district committee to be guided by circumstances in administering relief, the committee recommended the desirability of encouraging, with the means at their disposal, the establishment of permanent relief funds in their respective localities, and of aiding those already in operation." This sum of 20,000*l.* was, in the year 1864, apportioned to each inspection district in proportion to the tonnage of coal worked and the number of miners employed. The sum allotted to the Midland District was 1,201*l.* 3*s.* 4*d.*, which was vested in trustees. A resolution was passed by the colliery owners that grants should be made from this fund in the event of any colliery disaster involving the loss of 10 or more lives. No such disaster occurred in the Midland District until the year 1882, when the Clay Cross and Baddesley explosions occurred; and applications were then made to the trustees of this fund for grants towards the funds then being collected from the public. Prior to these explosions it had been resolved that a miners' relief society should be established in the Midland District similar to those societies in other mining districts, and it was in course of formation; and, as the money was given for the purpose of encouraging the establishment of such societies, application was also made to the trustees for a grant in aid of the formation. It appeared, from the published accounts of subscriptions, that over 9,000*l.* had been collected for the Clay Cross Explosion Fund, and 6,000*l.* or 7,000*l.* for the Baddesley Explosion Fund; and these sums were considered about sufficient to meet all the claims of the sufferers. The 1,201*l.* 3*s.* 4*d.* had, by the careful and judicious investments by the trustees, with the accumulated interest added, and the absence of any claims for relief, amounted to about 3,000*l.* in the 20 years. The trustees unanimously agreed to make a grant of 300*l.* to the Clay Cross Fund, and 200*l.* to the Baddesley Fund; and to hand over the balance of 2,500*l.* to "The Midland District Miners' Fatal Accident Relief Society" as a nucleus, and to give it stability at its formation; thus carrying out the original terms of the grant from the Hartley Fund. The same three trustees, with three other trustees added, are still the trustees of "The Midland District Miners' Fatal Accident Relief Society;" and the 2,500*l.* given at its formation has accumulated until the society's funds amounted, on the 31st December 1892, to a sum of 24,140*l.* 12*s.* 2*d.* The quinquennial valuation shows that at that date the society was perfectly solvent, and possessed a surplus of assets, over the estimated liabilities, of about 2,064*l.*				
	The particulars with regard to the Midland District Miners' Fatal Accident Relief Society are as follows:—				
	12 May 1883	2,064 – – Funds in hand on 31st December 1892, 24,140*l.* 12*s.* 2*d.* Liabilities, 20,892*l.* Surplus, after deducting 1,183*l.* 17*s.* increased value of securities, 2,064*l.*	277 83 widows and 194 children.	-	277 83 widows and 194 children now receiving relief, and others coming on the funds almost weekly.
TOTAL	-	10,611 5 9	330	45	285

North Staffordshire District.

The Longton Colliery Explosion Fund.†	October 1889	7,518 2 10 Balance in hand on 24th April 1893.	28 widows. 65 children. (The actuary's report of 14th March 1890 shows, 39 widows, 88 children, 12 dependent relatives, then receiving relief.)	28 widows. 65 children.	none.
The Hyde Colliery Explosion Fund.‡	January 1889	5,218 8 3 Balance in hand on 31st December 1892.	27	24	3
Talk-o'-th'-Hill Colliery Explosion Fund.§	1867	Present balance in hand, between 6,000*l.* and 7,000*l.*	20	6	100 cases have been relieved within the last two years.
TOTAL	-	19,236 11 1 (about.)	140	123	103

* There is an allowance made to the children of those who were killed in the accident when they are 10 years of age, and until they reach 13; up to age 10 they are dealt with from the club attached to the colliery; consequently so many children come and go off the fund annually.
† Mossfield Colliery Explosion occurred on the 16th October 1889, causing the loss of 64 lives.
‡ Hyde Colliery Explosion occurred on the 18th January 1889, causing the loss of 23 lives.
§ Talk-o'-th'-Hill Colliery Explosion occurred on the 13th December 1866, causing the loss of 91 lives.

South Staffordshire District.

NAME OF FUND.	Date of Foundation.	Amount of Surplus.	Number of Persons at present receiving Relief.	Number of Persons receiving Relief who have been receiving Relief from the Date of the Foundation of the Fund.	Number of Persons now receiving Relief who have become Recipients since the Foundation of each Fund.
South Staffordshire and East Worcestershire Mining Accident Fund. (Based upon a division in 1864 of part of the Hartley Colliery Accident Fund.)	8 February 1864	£. s. d. 2,669 – – The funds consisted of stock in Great Western Railway 5 per Cent. Consolidated Guaranteed Stock, 42,186*l.*, and credit at bank to Capital Account, 132*l.* 17*s.* 1*d.* at 31st December 1893.	23	- - none - -	23
Pelsall Hall Colliery Inundation Relief Fund.	April 1874 - -	4,449 18 6 In November and December 1891, 949*l.* 18*s.* 6*d.* in cash, and 2,000*l.* Great Indian Peninsula Railway Company Stock (worth about 3,500*l.*) was paid and transferred to the Paymaster General, under an Order of the Chancery Division, to form a fund to be called The Pelsall (Staffordshire) Mining Accident Fund. The 949*l.* 18*s.* 6*d.* and 3,500*l.* will be subject to the payment of the taxed costs, amounting to about 450*l.*, for obtaining an Order and settling the scheme for the future administration of the fund. The new scheme provides for the relief of widows, children, and other near relatives of miners who have been killed or injured by accident in the working of any mine within the district, and upon whom such relatives were dependent for support. It is expected that the first trustees will be elected very shortly, and the fund be in working order.	1	1	The fund was raised for a special accident, and was not applied to any other sufferers.
TOTAL - - - - - -		7,118 18 6	24	1	23

South Western District.

Abercarn Colliery Explosion Trust Fund.*	25 May 1880 -	23,723 11 1 on 31st March 1893. £. 23,347 15*s.* 5*d.* with trustees; 375*l.* 15*s.* 8*d.* with committee.	73	73	- - none.
Risca Colliery (1880) Explosion Relief Fund.†	1880 - - -	- - none - -	80	80	- - none.
Risca Colliery (1860) Explosion Relief Fund.†	1860 - - -	20 3 10 on 1st January 1893.	5	5	- - none.
Dyffryn Llan Colliery Explosion Relief Fund.	1 November 1886	486 8 9 The amount at present in hand. It is estimated that the surplus at the expiration of the fund, which takes place in September 1900, will amount to between 80*l.* and 100*l.*	15 Three widows; 12 children.	15 Three widows; 12 children.	- - none.
Malago Explosion Fund - -	4 September 1891	1,026 13 9 Value of fund now.	17	17	- - none.
Newbury Explosion Relief Fund	November 1869 -	75 6 – Original amount subscribed, with bank interest, 645*l.* 17*s.* 2*d.*	- - none - -	- - none - -	- - none.
Llanerch Colliery Explosion Trust Fund.	February 1890 -	23,086 – –	201	201	- - none.
TOTAL - - -	- - -	48,418 – –	391	391	—

South Wales District.

Ferndale Explosion (1867) Relief Fund.	November 1867 -	3,459 2 8 (Balance on 31 December 1892.)	18	18	—
Gethin Colliery Explosion Fund	February 1862 -	600 - -	5	—	—
Maesy Explosion Relief Fund -	23 December 1885	1,320 6 4	10	8	2
Park Slip Colliery Explosion Relief Fund.	29 August 1892 -	Not known - - -	253‡	184	65
Morfa Accident Fund - -	1890 - - -	16,500 – –	224	218	6
TOTAL - - -	- - -	24,279 9 –	510	428	73

* The trustees are now collecting money to pay the [illegible] to the Risca Colliery Explosion of 1880, and are to be assisted to grant monetary aid [illegible] and widows and children resulting from the Risca Explosion of 1880.

† These funds have been exhausted by repeated grants, supplemented from the balances of the Abercarn Fund, for some five years now past. The Abercarn Fund has [illegible] grant [illegible] and there is every probability further aid will continue.

‡ Compensation has been awarded, and application has been made to the Abercarn trustees to grant help, so that payments may be continued to the five [illegible] widows.

§ Temporary relief has been granted to 65 more [illegible] widows and children.

¶ The first payment to widows from the 1890 Explosion Fund was made on [illegible] 1893, and the payments relative to receiving 24 additional claims. The weekly payments to widows were made from the 2nd January 1893. These payments were as follows: [illegible] widow, 5*s.* per week; widow, 4*s.* per week; widow, 3*s.* per week; widow, 2*s.* per week; widow, 1*s.* per week. From 29th April 1893 the payments to the widows have been increased to 7*s.* per week each.

COLLIERY ACCIDENT FUNDS (GREAT BRITAIN).

RETURN setting forth the following Particulars in relation to the COLLIERY ACCIDENT FUNDS in *Great Britain*, which have been raised by Public Subscription for the Relief of Miners' Widows and Children: (1) the Number and the Date of the Foundation of these Funds; (2) the Amount and Surplus in each Fund; (3) the Number of Persons at present receiving Relief from these Funds; (4) the Number of Persons receiving Relief who have been receiving Relief from the Date of the Foundation of each Fund; and (5) the Number of Persons now receiving Relief who have become Recipients since the Foundation of each Fund.

(*Mr. John Wilson—Durham.*)

Ordered, by The House of Commons, *to be Printed*,
3 *August* 1893.

[*Price* 1 *d.*]

359. *Under* 1 *oz.*

CROWN LANDS (FOREST CLAUSES).

RETURN to an Order of the Honourable The House of Commons, dated 27 June 1893;—*for*,

COPY "of the Correspondence between the COMMISSIONERS of WOODS and FORESTS, and the VERDERERS of the NEW FOREST, regarding the FOREST CLAUSES in the CROWN LANDS BILL."

Treasury Chambers,
30 June 1893.

JOHN T. HIBBERT.

(*Mr. Jackson.*)

Ordered, by The House of Commons, *to be Printed*,
5 *July* 1893.

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COPY of the Correspondence between the COMMISSIONERS of WOODS and FORESTS and the VERDERERS of the NEW FOREST, regarding the FOREST CLAUSES in the CROWN LANDS BILL.

Clerk's Office, Romsey, Hampshire,
Sir, 23 March 1893.

I AM directed by the Right Honourable Evelyn Ashley, the Official Verderer, and the Verderers of the New Forest, to place the views of the Court of Verderers before you relative to the Crown Lands Bill, as reintroduced by your Department into Parliament this year, with certain alterations and extensions thereto; and especially as to certain clauses in such reintroduced Bill to which they feel compelled, as the guardians of the rights of the commoners, to take exception to.

The views of the Court of Verderers are as follows:—

1. That the words, "or for the purposes of recreation or amusement" should not appear in Clause 5. The Verderers observe that these words do not appear in the Report of 30th July 1890 of the Select Committee of the House of Commons on Crown Lands, &c., to which you refer in your letter of the 22nd February 1892, addressed to the then Official Verderer (Lord Montagu), as a justification for your action in introducing the Crown Lands Bill of last year, and the elasticity of the words quoted might lead to very extensive interference with the commoners' rights, and to considerable enclosures of the wastes of the forest.

2. That some limitation should be fixed as to the quantity of land which might, under the said Clause 5, be enclosed in any one place from the wastes of the forest for any of the objects named in the Bill (omitting recreation and amusement), and that this should not exceed 50 acres. It does not appear possible to fix any limit for roads and tramways.

3. That a proviso should be inserted in the Bill by which any land is sold or leased by the Crown for any of the purposes named in the Bill the commoners should be entitled to receive compensation in the same manner as they have obtained compensation in the case of lands sold or leased by your Department to railways, waterworks, or other works of a like nature.

Lastly. That with a view to enable this proviso to be carried into effect, the clauses known as the Verderers Clauses, which have been embodied in the Railway Acts and other Acts affecting the wastes of the forest (with some slight alterations or additions as may be necessary), should be inserted in the Crown Lands Bill.

The Court trusts these suggestions will be favourably considered by you, and I am to add that all opposition on the part of the Verderers will be withdrawn if clauses embodying these provisions were accepted.

I have, &c.

To George Culley, Esq., (signed) *G. F. W. Mortimer*,
Office of Woods, &c. Clerk to the Verderers.

(378.) Office of Woods, &c., S.W.,
Sir, 30 March 1893.

I AM directed by Mr. Culley to acknowledge the receipt of your letter of the 28th instant, stating that you are directed by the Official Verderer and the Verderers of the New Forest, to place the views of the Court of Verderers before him relative to the Crown Lands Bill now before Parliament. These views are then stated by you.

In reply, I am to inform you that the Bill has not any special or exclusive reference to the New Forest, and therefore no amendments or additions exclusively relating to that forest would seem to be called for.

1. Mr. Culley is not disposed to omit the words "or for the purposes of recreation or amusement" from Clause 5 of the Bill, as he considers that it is only reasonable and proper that the Crown should be empowered to grant privileges for recreation and amusement in its Royal Forests.

2. Mr. Culley has, however, no objection to insert words limiting the area to be dealt with in granting these and the other privileges mentioned in the clause to 50 acres on each occasion, as he does not suppose that more than that will ever be wanted.

3. The Bill does not seek to authorise the Crown to sell any land in the Royal Forests; and as it provides that any land leased for any of the purposes mentioned in Clause 5 is to be taken to be part of the total quantity which the Crown is entitled to enclose and hold in severalty freed from all rights of common, the introduction of any clauses for compensating the commoners in respect of such land would be inappropriate and unwarranted.

If, therefore, the Verderers of the New Forest seek to prevent the passing of the Bill, unless "Verderers Clauses" are inserted in relation to the New Forest, Mr. Culley will have to advise the Government to introduce words excepting the New Forest from the operation of the Bill, as the provisions of the Bill generally are of too much importance to the land revenues of the Crown to be postponed.

I am, &c.

To G. F. W. Mortimer, Esq., (signed) *J. Russell Sowray.*
Clerk to the New Forest Verderers.

(No. 377.) Clerk's Office, Romsey, Hampshire,
Sir, 18 April 1893.

I AM directed by the Right Honourable Evelyn Ashley, Official Verderer, and the Verderers present at a meeting held on the 12th instant, to acknowledge the receipt of your communication of the 30th March 1893, in reply to the letter I had the honour to address to you by order of the Court on the 28th March last, relative to the Crown Lands Bill now before Parliament.

With reference to your statement that you are not disposed to omit the words "for the purposes of recreation or amusement" from Clause 5 of the Bill, as you consider that it is only reasonable and proper that the Crown should be empowered to grant privileges for recreation and amusement in its Royal Forests, the Verderers would observe (in addition to their former remarks in their communication of the 28th March) that the proposed power of leasing does not seem to be necessary in order that the Crown should be empowered to grant such privileges in its Royal Forests. A power of giving annual licenses would be sufficient for the purposes named.

The Verderers note that you consider that the introduction of any clauses for compensating the commoners in respect of lands which may be compulsorily taken for the purposes named in Section 5 and Section 8 of the Bill would be inappropriate and unwarranted, and that you conclude by saying that if the Verderers of the New Forest seek to prevent the passing of the Bill, unless Verderers Clauses are inserted in relation to the New Forest, you will advise the Government to introduce words excepting the New Forest from the operation of the Bill. In view of this definite refusal to introduce any clauses into the Crown Lands Bill for compensating the commoners in respect of lands to be taken under the provisions of the Bill, the Verderers are of opinion that they cannot withdraw from the position they have taken up in the interests of the commoners of the New Forest.

Parliament has ever recognised the New Forest as standing in an exceptional position, and consequently legislation dealing with it has for a long series of years been by separate enactment. The Verderers, as the constituted authority in the forest by the New Forest Act, 1877, desire that this course should, as a general rule, be followed, although they might be disposed to waive this preliminary objection in this instance were the interests of which they are the guardians fairly recognised and properly safeguarded.

Whether

Whether as individuals or as a Court the Verderers yield to no one in the earnest desire to promote "the recreation and amusement" afforded to the public by the open forest, as their past action amply testifies. Indeed, they venture to affirm that to the exertions of the commoners whose interests the Verderers represent, it is alone due that the public still do enjoy the privileges afforded by an open forest.

Again, the Verderers claim to have at heart, equally with the Office of Woods, the local advantages mentioned in the 5th and 8th clauses of the Bill, but Parliament has provided adequate means by which promoters of public works of utility can obtain land for the purposes of their undertakings, under the Public Health Act, 1875, and the Acts incorporated therewith, and by Private Bill or Provisional Order.

In any proceedings taken in pursuance of these regular methods, as provided by Parliament in such cases, the Verderers have the opportunity of insisting upon the commoners being properly compensated in respect of any rights which are sought to be compulsorily acquired by the promoters.

The Verderers must therefore leave you to advise the Government to introduce words into the Bill excepting the New Forest from its operation.

I am, &c.

To George Culley, Esq.,
Office of Woods, &c.

(signed) *G. F. W. Mortimer*,
Clerk to the Verderers.

(565.)

Office of Woods, &c., S.W.,
22 April 1893.

Sir,

I AM directed by Mr. Culley to acknowledge the receipt of your letter of the 18th instant, further relative to the Crown Lands Bill, now before Parliament, and to request that you will submit to the Verderers of the New Forest the following remarks as his reply to their further communication.

Although the recommendation of the Select Committee of the House of Commons, that power should be given to the Commissioners of Woods to grant leases in the Royal Forests does not expressly mention "purposes of recreation and amusement," it applies to all works of "public utility," and was made with a view to obviate the "difficulty in providing the conveniences which are requisite for the comfort of the inhabitants" of the towns and villages within the ambit or close on the borders of the Royal Forests. It may, therefore, be fairly inferred that the Committee did not intend to exclude from their recommendation the grant of leases for purposes of recreation and amusement, and a lease is sometimes as necessary when the use of land is required for those purposes as when it is wanted for other works of public utility requisite for the comfort of the inhabitants. For example, in the case of a local cricket club, to whom the privilege of playing cricket in the forest has been granted, the club may reasonably desire to put up a pavilion, or some kind of shelter, as a necessary convenience in connection with the privilege, but they may well hesitate to incur the requisite outlay on a mere tenancy at will; but if the inhabitants of the New Forest express a desire that grants "for recreation and amusement" should be during pleasure only, Mr. Culley will not object to the Bill being modified to that extent, and he has already expressed his concurrence in the proposal, that no lease under the extended powers should extend to more than 50 acres.

With reference to the Verderers' remarks as to the clauses they wish to be introduced in the Bill, entitling the commoners to compensation for all Crown land granted by the Crown for purposes of public utility, I am directed by Mr. Culley to repeat what has already been pointed out to you, that such clauses are inappropriate and inadmissible. The Select Committee of 1890, after recommending the extended powers of leasing now sought to be obtained, added that "the extended powers might be limited and guarded so as to "prevent any undue exercise of them; and, in order to provide a guarantee "against an invasion on the rights of commoners, it should be declared that all "uninclosed waste land granted by the Crown in pursuance of the extended "power, is to be taken to be part of the land which the Crown is at the time "authorised to inclose, so that the total quantity which the Crown is empowered "to inclose shall not be increased, but only that in regard to the land inclosed

"under the extended power the Commissioners of Woods shall be freed from "any obligation to appropriate it for the growth of timber and trees."

The Bill is drawn in conformity with this recommendation, and precludes the consideration of compensation clauses in favour of the commoners.

With regard to your reference to Section 8 of the Bill as justifying a provision for compensating the commoners for lands which may be sold under it, I am desired to point out that the power of sale given in that section is in substitution for the existing power of the Crown to make free grants of land for churches, chapels, &c. (being strictly limited both as to amount and object), and that no power of sale would have been inserted in the Bill if it had not been absolutely necessary to make some provision for the acquisition of sites for churches, chapels, and burial grounds in the Royal Forests.

The Verderers' statement that "Parliament has ever recognised the New "Forest as standing in an exceptional position, and consequently legislation "dealing with it has for a long series of years been by express enactment," is entirely erroneous. When any radical change in management or special inquiry as to rights in the New Forest has been directed by Parliament, it has mostly been done by special Act, inasmuch as the subject-matter was sufficiently large for a separate legislation. The Act of William 3, empowering the Crown to make inclosures, the Acts 39 & 40 Geo. 3 (and its amending Acts), for the better preservation of the timber, and for ascertaining the boundaries of the forest, the Deer Removal Act (1851), and its amending Acts, and the New Forest Act, 1877, and its amending Act of 1879, are instances of special legislation, and some of the amending Acts were made special because the matter was urgent, and no other subject relating to the Crown Land Revenues called for legislation; but I am to refer you to the following Acts not exclusively relating to the New Forest, but containing express exactments affecting it, as showing that the Verderers are mistaken in their statement.

Act 48 Geo. 3, c. 82 (both New and Dean Forests).
Act 10 Geo. 4, c. 50 (General Crown Lands Act).
Act 1 & 2 Will. 4, c. 32 (General Game Act).
Act 12 & 13 Vict. c. 81 (both New and Waltham Forests).
Act 16 & 17 Vict. c. 56 (General Crown Lands Act).
Act 29 & 30 Vict. c. 62 (General Crown Lands Act).

You refer to the Verderers as "the constituted authority in the forest, by the New Forest Act, 1877," and as this form of words might be misunderstood, and might admit of the inference that the Verderers were the only authority, I am to remind you that, while under the Act of 1877 they are constituted for certain purposes, and presided over by a Crown officer styled the Official Verderer, their duties and powers are defined and limited almost entirely to the regulation of the exercise of the rights of common and the abatement of encroachments in the forest, while the forest itself, which belongs to the Crown, was, by the Act 10 Geo. 4, c. 50, placed under the management of the Commissioners of Woods, and by Warrant under the Act 14 & 15 Vict. c. 42, the management and direction of it has been vested in Mr. Culley, who is therefore the constituted authority in the forest having its management and direction.

Mr. Culley does not desire to question that part of your letter in which the Verderers express their earnest desire to promote the recreation and amusement of the public in the New Forest, and bear testimony to the exertions of the commoners (whose interests you state the Verderers represent) on behalf of the privileges of the public.

It appears to Mr. Culley, however, that the best way of promoting the interests of the general public (not merely that portion of the public which has pecuniary interests in the forest) will be to assist in carrying into effect the recommendations of the Select Committee of the House of Commons as embodied in the Bill now before Parliament.

To G. F. W. Mortimer, Esq.,
Clerk to the New Forest Verderers.

I am, &c.
(signed) *J. Russell Sowray.*

(No. 565.)

Clerk's Office, Romsey, Hamphire,
Sir, 25 April 1893.

I BEG to acknowledge the receipt of your communication of the 22nd instant, which I will lay before the Verderers at their next Court of Swainmote, which is fixed for Monday the 8th May proximo, for their consideration.

I am, &c.
(signed) *G. F. W. Mortimer*,
Clerk to the Verderers.

To George Culley, Esq.,
Office of Woods, &c.

CROWN LANDS BILL.

Clerk's Office, Romsey, Hampshire,
Sir, 8 May 1893.

I AM directed by the Right Honourable Evelyn Ashley, Official Verderer, and the Verderers present to-day in their Court of Swainmote, to acknowledge your communication of the 22nd April last past, and in reply thereto, I am to refer you to the letter which I had the honour to address to you by Order of the Court on the 18th of April last.

I am to add that the Court sees no reason to alter the views therein expressed.

I have, &c.
(signed) *G. F. W. Mortimer*,
Clerk to the Verderers.

To George Culley, Esq.

CROWN LANDS (FOREST CLAUSES).

COPY of the Correspondence between the Commissioners of Woods and Forests, and the Verderers of the New Forest, regarding the Forest Clauses in the Crown Lands Bill.

(Mr. Jackson.)

Ordered, by The House of Commons, *to be Printed,*
5 *July* 1893.

[*Price* 1 *d.*]

309. *Under* 1 *oz.*

FEE FUND (HOUSE OF LORDS).

ACCOUNT of the FEE FUND of the HOUSE OF LORDS from 1st April 1892 to 31st March 1893.

Treasury Chambers,
31 July 1893.

JOHN T. HIBBERT.

ACCOUNT of the FEE FUND of the HOUSE OF LORDS from 1st April 1892 to 31st March 1893.

RECEIPTS.

	£.	s.	d.	£.	s.	d.
Balance at the Bank of England on the 1st April 1892 (inclusive of 6,092*l.* 1*s.* 10*d.* Security Money in hand)				6,542	12	6
Dividends on 42,000 *l.* Consols :—						
April 1892	281	10	8			
July 1892	281	10	8			
October 1892	281	10	8			
January 1893	281	10	8			
				1,126	2	8
Fees received :—						
On Private Bills, &c.	27,912	10	9			
„ Judicial Proceedings	1,932	5	6			
„ Introductions of Peers	330	15	2			
„ Taxation of Costs :—						
Private Bills, &c.	304	15	6			
Judicial Proceedings	338	8	10			
On Copying, Inspections, &c.	101	13	0			
				30,920	8	9
Introduction Fees due to Garter-King-of-Arms				74	13	4
Security Money in lieu of Bonds on Appeals				8,500	0	0
				£. 47,163	17	3

PAYMENTS.

	£.	s.	d.	£.	s.	d.
Retiring Allowances :—						
Mr. Pechell	304	10	0			
„ P. Birch	600	0	0			
„ L. Birch	538	6	8			
„ Parratt	1,200	0	0			
„ Disraeli	1,500	0	0			
„ Malony	366	13	4			
„ Holland	30	0	0			
„ Redford	125	0	0			
„ Bailey	80	0	0			
„ Hall	125	0	0			
„ Williamson	93	6	8			
„ Bricknell (Died 23rd Aug. 1892.)	33	14	6			
„ H. Holloway	150	0	0			
Mrs. Bennett (Died 12th Jan. 1893.)	211	10	0			
„ Dike (Died 19th May 1892.)	2	8	6			
„ Yates	25	4	0			
„ Webb	25	4	0			
„ Robinson	25	4	0			
„ Heath	30	0	0			
	5,466	1	8			
Less Income Tax	118	11	10			
				5,347	9	10
Introduction Fees to Garter	74	13	4			
Less Income Tax	1	17	4			
				72	16	0
Income Tax (as above) paid to Income Tax Commissioners				120	9	2
Paid to H.M. Exchequer as Extra Receipts				26,580	9	9
Security Money repaid				8,292	1	10
Balance at the Bank of England on the 31st March 1893 (inclusive of 6,300*l.* Security Money in hand), less outstanding Cheques				6,750	10	8
				£. 47,163	17	3

HENRY GRAHAM,
Cler: Parliamentor:

FEE FUND (HOUSE OF LORDS).

ACCOUNT of the FEE FUND of the HOUSE OF LORDS from 1 April 1892 to 31 March 1893.

(*Presented by Her Majesty's Command.*)

Ordered, by The House of Commons, *to be Printed,*
31 *July* 1893.

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355.

RETURN to an Address of the Honourable The House of Commons, dated 3 February 1893;—*for*,

"RETURN of the Number of VICTUALLERS', BEERHOUSE, and other LICENCES for the Sale of INTOXICATING LIQUORS, the Renewal of which has been Refused, in the Year 1892, by the JUSTICES OF THE PEACE in each LICENSING DISTRICT in *England* and *Wales*, showing in each Case the Ground of such Refusal, especially when such Ground was, in any instance, that the Licence was not Required; and showing also the Result of Appeal, if any (in continuation of Parliamentary Paper, No. 262, of Session 1892)."

Home Office,
3 July 1893.

HERBERT J. GLADSTONE.

(*Mr. John Ellis.*)

Ordered, by The House of Commons, *to be Printed*,
4 *July* 1893.

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JOHN MENZIES & Co., 12, HANOVER STREET, EDINBURGH, and
90, WEST NILE STREET, GLASGOW; or
HODGES, FIGGIS, & Co., LIMITED, 104, GRAFTON STREET, DUBLIN.

306.

RETURN of the Number of VICTUALLERS', BEERHOUSE, and other LICENSES for the Sale of INTOXICATING LIQUORS, the Renewal of which has been Refused, in the Year 1892, by the JUSTICES OF THE PEACE in each LICENSING DISTRICT in *England* and *Wales*, showing in each Case the Ground of such Refusal, especially when such Ground was, in any instance, that the License was not Required; and showing also the Result of Appeal, if any (in continuation of Parliamentary Paper, No. 262, of Session 1892).

COUNTIES.

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND.					
BEDFORDSHIRE:					
Ampthill District	0	0	0		
Bedford District	0	0	0		
Biggleswade District	0	0	0		
Leighton Buzzard District	0	0	0		
Luton District	0	0	0		
Sharnbrook District	0	0	0		
Woburn District	0	0	0		
BERKSHIRE:					
Abingdon District	0	0	0		
Faringdon District	0	0	0		
Forest District	0	0	0		
Ilsley District	0	0	0		
Lamborne District	0	0	0		
Maidenhead District	0	0	0		
Newbury District	0	0	0		
Reading District	0	0	0		
Moreton District	0	0	0		
Wantage District	0	0	0		
Windsor District	0	0	0		
BUCKINGHAMSHIRE:					
Ashendon District	0	0	0		
Aylesbury District	0	0	0		
Buckingham District	0	0	0		
Burnham District	0	0	0		
Chesham District	0	0	0		
Cottesloe District	0	0	0		
Desborough:					
First District	0	0	0		
Second District	0	0	0		
Newport Pagnell District	0	0	0		
Stoke District	0	0	0		
Stony Stratford District	0	0	0		
Winslow District	0	0	0		
CAMBRIDGESHIRE:					
Arrington and Melbourn District	0	0	0		
Bottisham District	0	0	0		
Cambridge District	0	0	0		
Caxton District	0	0	0		
Linton District	0	0	0		
Newmarket District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
ISLE OF ELY:					
Chatteris District	0	0	0		
Ely and South Witchford District	0	0	0		
North Witchford District	0	0	0		
Whittlesey and Thorney District	0	0	0		
Wisbech District	0	0	0		
CHESHIRE:					
Altrincham District	0	0	0		
Broxton District	0	0	0		
Bucklow District	0	0	0		
Chester Castle District	0	0	0		
Daresbury District	0	0	0		
Eddisbury District	0	0	0		
Hyde District	1	2	0	*Victuallers' License.*—License not renewed on account of premises being pulled down for railway extension. *Beerhouses.*—(1) License not renewed on account of premises being pulled down for railway extension. (2) Applicant not duly qualified as by law required.	
Leftwich District	0	0	0		
Nantwich District	0	0	0		
Northwich District	1	0	0	That the house was not necessary for the requirements of the neighbourhood, and had been conducted in a disorderly manner, the licensee being convicted of permitting drunkenness on several occasions, and the license was endorsed twice in six months.	An appeal to the quarter sessions was dismissed with costs.
Prestbury District	0	0	0		
Runcorn District	0	0	0		
Stockport District	0	0	0		
Wirral District	2	2	0	*Victuallers' Licenses.*—Applicants not deemed fit and proper persons to be licensed to keep the premises. *Beerhouse Licenses.*—Character of applicants.	*Victuallers' Licences.*—(1) License renewed conditionally that it should be transferred forthwith to a fit and proper person to be licensed to keep the premises, which has been done.—(2) These premises were arranged to be added to the adjacent house, also licensed; consequently there was not an appeal. *Beerhouse Licenses.*—Subsequently granted to new tenants at next special session of the justices.
CORNWALL:					
East, Middle, District	0	0	0		
„ North, District	0	0	0		
„ South, District	0	0	0		
Kerrier, East, District	1	0	0	That the premises were unfit; that the house was not required in the neighbourhood, and that the holder had been several times previously convicted of offences under the Intoxicating Liquors Acts.	
„ West, District	0	0	0		
Lesnewth District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
CORNWALL—*continued.*					
Penwith, East, District	0	0	0		
„ West, District	0	0	0		
Powder (Tywardreath) District	0	0	0		
„ East, District	0	0	0		
„ South, District	0	0	0		
„ West, District	0	0	0		
Pydar, East, District	0	0	0		
Stratton District	0	0	0		
Trigg District	0	0	0		
West District	1	0	0	License considered unnecessary for the wants of the neighbourhood.	
ISLES OF SCILLY:					
Scilly Islands District	0	0	0		
CUMBERLAND:					
Allerdale-above-Derwent District	2	1	0	*Victualler's Licenses.*—(1) The licensee was served by the Superintendent of Police with notice of objection, on the ground that the house was unnecessary. (2) The licensee was served by the Superintendent of Police with notice of objection, on the ground that he had been convicted of an offence against the Licensing Acts; and that the house was unnecessary. *Beerhouse License.*—The licensee did not apply for renewal; the justices imposed this condition before granting the renewal of a victualler's license to premises in the immediate vicinity, belonging to the same owner.	Quarter sessions reversed the decision of the justices at the General Annual Licensing Meeting.
Allerdale-below-Derwent District	0	0	0		
Bootle District	0	0	0		
Brampton District	0	0	0		
Cumberland Ward District	2	0	0	In both cases owing to convictions under the Licensing Acts against the holders of the licenses, and also that such licenses were not required.	
Derwent District	1	0	0	House not required, in consequence of it not having been used as a public-house for three years; no liquors being sold during that period.	
Keswick District	0	0	0		
Leath Ward District	11	0	0	In two cases license not required; in nine other cases, premises not having been used as licensed premises during the last 12 months, renewals refused.	
Longtown District	0	0	0		
Workington District	0	0	0		
DERBYSHIRE:					
Alfreton District	0	0	0		
Appletree (Sudbury) District	0	0	0		
Ashborne District	0	0	0		
Bakewell District	0	0	0		
Belper District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
DERBYSHIRE—*continued.*					
Buxton District	0	0	0		
Chapel-en-le-Frith District	0	0	0		
Chesterfield District	0	0	0		
Derby District	0	0	0		
Eckington District	0	0	0		
Glossop District	0	0	0		
Repton District	0	0	0		
Smalley District	0	0	0		
Swadlincote District	0	0	0		
Wirksworth District	0	0	0		
DEVON:					
Axminster District	0	0	0		
Bideford District	0	0	0		
Braunton District	0	0	0		
Crediton District	0	0	0		
Crockernwell District	0	0	0		
Cullompton District	0	0	0		
Ermington and Plympton District	0	0	0		
Hatherleigh District	0	0	0		
Holsworthy District	0	0	0		
Honiton District	0	0	0		
Lifton District	0	0	0		
Ottery District	0	0	0		
Paignton District	0	0	0		
Roborough, Midland, District	0	0	0		
,, South, District	0	0	0		
South Molton District	0	0	0		
Stanborough and Coleridge District	0	0	0		
Tavistock District	0	0	0		
Teignbridge District	0	0	0		
Torquay District	0	0	0		
Torrington, Great, District	0	0	0		
Wonford District	0	0	0		
Woodbury District	0	0	0		
DORSET:					
Blandford District	0	0	0		
Bridport District	0	0	0		
Cerne District	0	0	0		
Dorchester District	0	0	0		
Shaston District	0	0	0		
Sherborne District	0	0	0		
Sturminster District	0	0	0		
Wareham District	0	0	0		
Wimborne District	0	0	0		
DURHAM:					
Barnard Castle District	0	0	0		
Bishop Auckland District	2	0	0	License holders been convicted of offences against Licensing Acts, and houses badly conducted.	Both appealed against, and appeals dismissed.
Castle Eden District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
DURHAM—*continued.*					
Chester-le-Street District	0	0	0		
Darlington District	0	0	0		
Durham District	0	0	0		
Gateshead District	0	0	0		
Houghton-le-Spring District	0	0	0		
Lanchester and Consett District	0	0	0		
Seaham Harbour District	0	0	0		
South Shields District	0	0	0		
Stanhope District	0	0	1	That the license was not required.	
Stockton District	0	0	0		
Sunderland District	0	0	0		
West Hartlepool District	0	0	0		
Wolsingham District	0	0	0		
ESSEX:					
Beacontree District	0	0	0		
Brentwood District	0	0	0		
Chelmsford District	0	0	0		
Dengie District	0	1	0	Applicant not the real resident holder and occupier.	No appeal.
Dunmow District	0	0	0		
Epping District	0	0	0		
Freanwell District	0	0	0		
Harlow District	0	0	0		
Hinckford, North, District	0	0	0		
Hinckford, South, District (Halstead Bench).	0	0	0		
Hinckford, South, District (Braintree Bench).	0	0	0		
Lexden and Winstree District	0	0	0		
Ongar District	0	0	0		
Orsett District	0	0	0		
Rochford District	0	0	0		
Romford District	0	0	0		
Tendring District	0	0	0		
Walden District	0	0	0		
Witham District	0	0	0		
GLOUCESTERSHIRE:					
Berkeley District	0	0	0		
Campden District	0	0	0		
Cheltenham District	0	0	0		
Cirencester District	0	0	0		
Coleford District	0	0	0		
Dursley District	0	0	0		
Fairford District	0	1 (off license).	0	Premises closed for some months, owing to the death of the licensee, and refused on application for renewal, on the ground that license not required.	
Gloucester District	0	0	0		
Horsley District	1	0	0	That such license was not necessary for the requirements of the neighbourhood, as testified by the fact that no excise license had been taken out for the previous five years.	

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (in any).
ENGLAND—*continued.*					
GLOUCESTERSHIRE—*continued.*					
Lawford's Gate District	0	0	0		
Lydney District	0	0	0		
Moreton-in-Marsh District	0	0	0		
Newent District	0	0	0		
Newnham District	0	0	0		
Northleach District	0	0	0		
Sodbury District	0	0	0		
Stow District	0	0	0		
Stroud District	0	0	0		
Tetbury District	0	0	0		
Tewkesbury District	0	0	0		
Thornbury District	0	0	0		
Whitminster District	0	0	0		
Winchcomb District	0	0	0		
Wotton-under-Edge District	0	0	0		
HEREFORDSHIRE:					
Bredwardine District	0	0	0		
Bromyard District	0	0	0		
Dore District	0	0	0		
Harewood End District	0	0	0		
Hereford District	0	1	0	That the applicant failed to produce satisfactory evidence of good character (Sub-section 1, Section 8, of 32 & 33 Vict., c. 27).	
Kington District	0	0	0		
Ledbury District	0	0	0		
Leominster District	1	0	0	The application was made by the landowners adjacent to a new line of railway, which is about to be constructed from Leominster to Bromyard, but the Bench ruled that the license was not required on account of the new railway as was set out.	
Ross District	0	0	0		
Weobley District	0	0	0		
Wigmore District	0	0	0		
HERTFORDSHIRE:					
Albury District	0	0	0		
Barnet District	0	0	0		
Bishops Stortford District	0	0	0		
Buntingford District	0	0	0		
Cheshunt District	0	0	0		
Dacorum District	0	0	0		
Hertford District	0	0	0		
Hitchin District	0	0	0		
Odsey District	0	0	0		
St. Albans District	0	0	0		
Stevenage District	0	1	0	House frequented by thieves, &c.	No appeal.
Ware District	0	0	0		
Watford District	0	0	0		
Welwyn District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
HUNTINGDONSHIRE:					
Hurstingstone District	0	0	0		
Leightonstone District	0	0	0		
Norman Cross District	0	0	0		
Ramsey District	0	0	0		
Toseland District	0	0	0		
KENT:					
Ashford District	0	0	0		
Aylesford, North, District	0	0	0		
„ Upper South, District	0	1	0	Renewal refused on the grounds set forth in Sub-section 2 of Section 8, 32 & 33 Vict. c. 27.	Appeal to West Kent Quarter Sessions on the 16th October 1892, was dismissed with costs.
Bearsted District	0	1	0	That license holder was not a person of good character, and that premises were frequented by persons of bad character.	No appeal.
Bromley District	0	0	0		
Cranbrook District	0	0	0		
Dartford District	0	1	0	This was a refusal to grant a transfer of the license on the ground of its being a disorderly house. No application was made at the general annual licensing meeting held subsequently for a renewal.	
Elham District	0	0	0		
Faversham District	0	0	0		
Ramsgate District	0	0	0		
St. Augustine's (Home or West) District.	0	0	0		
Sevenoaks District	0	0	0		
Tonbridge District	0	0	0		
Tunbridge Wells District	0	0	0		
Wingham District	0	0	0		
ROMNEY MARSH LIBERTY	0	0	0		
LANCASHIRE:					
Amounderness District	0	0	0		
Ashton-under-Lyne District	0	0	0		
Blackburn, Higher, District	0	0	0		
„ Lower, District	0	0	0		
Bolton District	0	0	0		
Bury District	1	0	0		
Childwall District	0	0	0	Character of applicant; he having been twice convicted for offences against the Licensing Act.	No appeal.
Church District	0	0	0		
Clitheroe District	0	0	0		
Colne District	0	0	0		
Garstang District	0	0	0		
Hawkshead District	0	0	0		
Hornby District	0	0	0		
Kirkdale District	0	0	0		
Kirkham District	0	0	0		
Leigh District	0	0	0		
Leyland District	0	0	0		
Leyland Hundred District	0	0	0		
Lonsdale, North, District	1	0	0	License not required	Appeal not proceeded with
Lonsdale, South of the Sands, District.	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
LANCASHIRE—*continued.*					
Manchester District	0	0	0		
Middleton District	0	0	0		
Oldham District	0	1	0	House frequented by thieves, and persons of bad character.	Justices' decision reversed at quarter sessions.
Ormskirk District	3	0	0	That having regard to the character, wants, and requirements of the locality and neighbourhood, there was no necessity there for such licensed houses, and that the said houses and premises were not suitable, or adapted for the purpose of such licenses.	In two cases there was no appeal; in the other case the appeal was dismissed with costs.
Over Darwen District	0	0	0		
Prescot District	0	0	0		
Rossendale District	0	0	1	Beer off license not required	No appeal.
St. Helens District	0	0	0		
Southport District	0	0	0		
Walton-le-Dale District	0	0	0		
Warrington District	0	0	0		
Wigan District	0	0	0		
LEICESTERSHIRE:					
Ashby-de-la-Zouch District	0	0	0		
Belvoir District	0	0	0		
Leicester District	0	0	0		
Loughborough District	0	1	0	On the ground that the applicant had been convicted of being drunk, and refusing to quit licensed premises, and was not a fit and proper person to hold the license.	
Lutterworth District	0	0	0		
Market Bosworth District	0	0	0		
Market Harborough District	0	0	0		
Melton Mowbray District	0	0	0		
Norton, East, District	0	0	0		
LINCOLNSHIRE:					
PARTS OF HOLLAND:					
Elloe District	0	0	0		
Kirton and Skirbeck District	0	0	0		
PARTS OF KESTEVEN:					
Bourn District	0	0	0		
Lincoln District	0	0	0		
Sleaford District	0	1	0	That no Excise license had been applied for, in pursuance of the license granted by justices assembled at the general annual licensing meetings for the said district for several years past, and that the house was not required as licensed premises.	No appeal.
Spittlegate District	0	1	0	License not required	At quarter sessions the justices' decision was reversed on appeal against their refusal of this license, as the same could only be refused on the four grounds mentioned in the Wine and Beerhouse Act, 1869, s. 8, it being a beerhouse licensed before this Act was passed.

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
LINCOLNSHIRE—*continued.*					
PARTS OF LINDSEY:					
Alford District	0	0	0		
Barton-on-Humber District	0	0	0		
Brigg District	0	0	0		
Caistor District	0	0	0		
Epworth District	0	0	0		
Gainsborough District	0	0	0		
Great Grimsby, (or Bradley Haverstoe) District.	0	0	0		
Horncastle District	0	0	0		
Lincoln, Bail and Close of, District	0	0	0		
Louth District	0	0	0		
Market Rasen District	0	0	0		
Spilsby District	0	0	0		
Winterton District	0	0	0		
Wragby District	0	0	0		
LONDON COUNTY:					
Blackheath District	0	0	0		
Finsbury District	0	0	0		
Holborn District	2	0	0	Complaints by police	The licenses were both granted on appeal.
Kensington District	0	0	0		
Newington District	0	4	1	Not required.	
Paddington District	0	1	0	That the house was of a disorderly character, and was frequented by thieves, prostitutes, and persons of bad character.	Appeal dismissed.
Penge District	0	0	0		
St. George's, Hanover Square, District.	0	0	0		
St. James' District	0	0	0		
St. Margaret's District	1	0	0	On the ground that the house had been badly conducted.	
St. Marylebone District	1	0	0	Opposed by inhabitants of the neighbourhood.	Appeal, dismissed 9th April 1892.
St. Pancras District	0	0	0		
Stoke Newington District	0	0	0		
Strand District	0	0	0		
Tower District	3	4	0	*Victuallers' Licences.*—(1.) Convictions, for attempting to bribe a police constable whilst on duty, and for illegal trading.	Allowed on appeal.
				(2.) For permitting public music, without license, on licensed premises.	Allowed on appeal.
				(3.) Conviction for illegal trading	No appeal prosecuted.
				Beerhouse Licences.—(1.) Applicant failed to supply evidence of good character, as by law required.	Appeal dismissed.
				(2). (3). (4). Applicants not the real residents and holders of premises, as by law required.	No appeal prosecuted.
				Victuallers' License.—That such license was not required, and that such house had not been conducted in a proper manner.	On promise of a new tenant, and on condition of Respondents' costs being paid; appeal allowed.
Wandsworth District	1	0	1	*Beer and Wine Restaurant License.*—That such license was not required, and that such house had been conducted in a manner not in accordance with the intention of the justices, the understanding having been that it should be carried on as a refreshment house and confectioner's business, and not as a beerhouse.	Appeal allowed, and license granted, subject to the undertaking that the premises shall be used as a refreshment house and confectioner's business, as originally contemplated, and that there shall be no sale of liquor in jugs, and the Respondents' costs to be paid by the Appellant.

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
LONDON COUNTY—*continued.*					
THE CITY OF LONDON	0	0	0		
TOWER, LIBERTY OF THE	0	0	0		
MIDDLESEX:					
Brentford District	0	0	0		
Edmonton (including Enfield) District.	0	0	0		
Gore District	0	0	0		
Highgate	1	0	1	*Victuallers' License.*—Tenant having been convicted for assaults committed on the licensed premises, and house not required for wants of neighbourhood. *Beerhouse License.* — Tenant having been convicted for selling intoxicating liquor, in contravention of his license, and his license endorsed.	Both licenses granted on appeal.
South Mimms District	0	1	0	Insufficient qualification	Appeal dismissed, with costs.
Spelthorne District	0	0	0		
Uxbridge District	0	0	0		
Willesden District	0	1	0	That the house had been closed for some time, and was therefore not required, and that the licensee was not the resident occupier.	No appeal.
MONMOUTHSHIRE:					
Abergavenny District	0	0	1 (off beer license).	The license not being used, and that it was unnecessary.	
Bedwellty District	1	0	0	License not required in district, and no excise license taken out for many years.	No appeal.
Caerleon District	0	1	0	Sufficient public-house accommodation in the neighbourhood; license not required.	No appeal.
Chepstow District	0	0	0		
Monmouth District	0	0	0		
Newport District	0	0	0		
Pontypool District	0	0	0		
Raglan District	0	0	0		
Skenfrith District	0	0	0		
Trelleck District	0	0	0		
Usk District	0	0	0		
NORFOLK:					
Blofield and Walsham District	0	0	0		
Clackclose District	0	0	0		
Clavering and Loddon	0	0	0		
Depwade District	0	0	0		
Diss District	0	0	0		
Earsham District	0	0	0		
Erpingham, North, District	0	0	0		
Erpingham, South, District	0	0	0		
Eynsford District	0	0	0		
Flegg, East and West, District	0	0	0		
Forehoe District	0	0	0		
Freebridge Lynn District	0	0	0		
Freebridge Marshland District	0	0	0		
Gallow District	0	0	0		
Greenhoe, North, District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
NORFOLK—*continued.*					
Greenhoe, South, District	0	0	0		
Grimshoe District	0	0	0		
Guiltcross and Shropham District	0	0	0		
Happing and Tunstead District	0	0	0		
Holt District	0	0	0		
Launditch and Mitford District	0	0	0		
Smithdon and Brothercross District	0	0	0		
Swainsthorpe District	0	0	0		
Taverham District	0	0	0		
Wayland District	0	0	0		
NORTHAMPTONSHIRE:					
Bowden, Little, District	0	0	0		
Brackley District	0	0	0		
Daventry District	0	0	0		
Kettering District	0	0	0		
Northampton District	0	0	0		
Oundle District	0	0	0		
Thrapston District	0	0	0		
Towcester District	0	0	0		
Wellingborough District	0	0	0		
SOKE OF PETERBOROUGH	0	0	0		
NORTHUMBERLAND:					
Bamburgh Ward District	0	0	0		
Bedlingtonshire District	0	0	0		
Bellingham District	0	0	0		
Castle Ward, East, District	0	0	0		
„ West, District	0	0	0		
Coquetdale Ward, East, District	1	0	0	House unoccupied, and been closed for over 12 months; license not required.	No appeal.
„ North District	0	0	0		
„ West District	0	0	0		
Glendale Ward District	0	0	0		
Haltwhistle District	0	0	0		
Morpeth Ward District	0	0	0		
Norham and Islandshire District	0	0	0		
Tindale Ward District	0	1	0	Premises unfit, owing to bad repair.	
NOTTINGHAMSHIRE:					
Bingham District	1	0	0	Renewal refused on ground of house not being used.	
Mansfield District	0	0	0		
Newark District	0	0	0		
Nottingham District	0	0	0		
Retford District	4	0	0	All four licensed premises having ceased for some years to be used for the business of licensed victuallers, and having only renewed the justices' certificates, it was held that the houses were not required, and the licenses were refused.	
Southwell District	0	0	0		
Worksop District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
OXFORDSHIRE:					
Bampton, East, District	0	0	0		
„ West, District	0	0	0		
Banbury and Bloxham District	0	0	0		
Bullingdon District	0	0	0		
Chadlington District	0	0	0		
Henley District	0	0	0		
Ploughley District	0	0	0		
Watlington District	0	0	0		
Wootton, North, District	0	0	0		
„ South, District	0	0	0		
RUTLAND COUNTY	0	0	0		
SALOP:					
Albrighton District	0	0	0		
Brimstree-Shifnal District	0	0	0		
Brimstree, South, and Chelmarsh District.	0	0	0		
Burford District	0	0	0		
Chirbury District	0	0	0		
Cleobury Mortimer District	0	0	0		
Clun and Purslow District	0	0	0		
Condover District	0	0	0		
Drayton District	0	0	0		
Ford District	0	0	0		
Munslow, Lower, &c., District	0	0	0		
„ Upper, District	0	0	0		
Newport District	0	0	0		
Oswestry District	0	0	0		
Pimhill District	0	0	0		
Wem District	0	0	0		
Wellington District	1	0	0	License not required	No appeal.
	0	0	1 (off beer license).	License not required, and licensee having been twice previously convicted for offences against licensing laws.	ditto.
Whitchurch District	0	0	0		
SOMERSET:					
Axbridge District	0	0	0		
Bishop's Lydeard District	0	0	0		
Bridgwater District	0	0	0		
Crewkerne District	0	0	0		
Dulverton District	0	0	0		
Dunster District	0	0	0		
Frome District	0	0	0		
Ilminster District	0	0	0		
Keynsham District	0	0	0		
Kilmersdon District	0	0	0		
Long Ashton District	0	0	0		
Shepton Mallet District	0	0	0		
Somerton District	0	0	0		
Taunton District	0	0	0		
Temple Cloud District	0	0	0		
Wellington District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
SOMERSET—*continued.*					
Wells District	0	0	0		
Weston District	0	0	0		
Williton District	0	0	0		
Wincanton District	0	0	0		
Wiveliscombe District	0	0	0		
Yeovil District	0	0	0		
SOUTHAMPTON:					
Alton District	0	0	0		
Andover District	0	0	0		
Basingstoke District	0	0	0		
Droxford District	0	0	0		
Fareham District	0	0	0		
Kingsclere District	0	0	0		
Lymington and New Forest District (Lymington and New Forest Division).	0	0	0		
Lymington and New Forest District (New Forest Union and Lyndhurst Division).	0	0	0		
Lymington and New Forest District (Hythe Division).	0	0	0		
Odiham District	0	1	0	The tenant of this house was convicted of felony, and the license (granted before 1869) consequently forfeited. Application was made by owner under 37 & 38 Vict. c. 49, s. 15, for a license, and refused on the ground that such license was not required.	Notice of appeal was given, but the appeal was not proceeded with.
Petersfield District	0	0	0		
Ringwood District	0	0	0		
Romsey District	0	0	0		
Southampton District	0	0	0		
Winchester District (Winchester Division).	0	0	0		
Winchester District (Alresford Division).	0	0	0		
ISLE OF WIGHT	0	0	0		
STAFFORDSHIRE:					
Bilston District	0	0	0		
Brownhills and Lichfield	0	0	0		
Burton-on-Trent District	0	0	0		
Cheadle District	0	0	0		
Eccleshall District	0	0	0		
Handsworth District	0	0	0		
Kingswinford and Wordsley District	2	0	0	Badly conducted by license holders.	
Leek District	0	0	0		
Penkridge District	1	0	0	That the premises were open to several private houses, and the police could not exercise proper supervision over same.	No appeal.
Pirehill, North, District	0	0	0		
Rowley Regis District	0	0	0		
Rugeley District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
STAFFORDSHIRE—*continued.*					
Rushall District	0	0	0		
Stafford District	0	0	0		
Stone District	0	0	0		
Tamworth District	0	0	0		
Uttoxeter District	0	1	0	Badly conducted, and previous convictions.	No appeal.
Wolverhampton District	0	0	0		
SUFFOLK, EAST:					
Beccles District	0	0	0		
Blything District	0	0	0		
Bosmere and Claydon District	0	0	0		
Bungay District	0	0	0		
Framlingham District	0	0	0		
Hartismere District	0	0	0		
Hoxne District	0	0	0		
Mutford and Lothingland District	0	0	0		
Samford District	0	0	0		
Stow District	0	0	0		
Woodbridge District	0	0	0		
SUFFOLK, WEST:					
Blackbourn District	0	0	0		
Boxford District	0	0	0		
Clare (or Risbridge) District	0	0	0		
Cosford District	0	0	0		
Lackford District	0	0	0		
Melford District	0	0	0		
Newmarket District	0	0	0		
Thingoe and Thedwastre District	0	0	0		
SURREY:					
Chertsey District	0	0	0		
Croydon District	0	0	0		
Dorking District	0	0	0		
Epsom District	0	0	0		
Farnham District	0	0	0		
Godstone District	0	0	0		
Guildford District	0	0	0		
Kingston District	0	0	0		
Reigate District	0	0	0		
Richmond District	0	0	0		
Wimbledon District	0	0	0		
SUSSEX, EAST:					
Battle District	0	0	0		
Burwash District	0	0	0		
Cuckfield District	0	0	0		
East Grinstead District	0	0	0		
Frant District	0	0	0		
Hailsham District	0	0	0		
Hastings District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c. —*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
SUSSEX, EAST—*continued.*					
Hove District	0	0	0		
Lewes District	0	0	0		
Rye District	0	0	0		
Uckfield District	0	0	0		
SUSSEX, WEST:					
Arundel District	0	0	0		
Chichester District	0	0	0		
Horsham District	0	0	0		
Midhurst District	0	0	0		
Petworth District	0	0	0		
Steyning District	0	0	0		
Worthing District	0	0	0		
WARWICKSHIRE:					
Alcester District	0	0	0		
Atherstone District	0	0	0		
Birmingham District	0	0	0		
Brailes District	0	0	0		
Burton Dassett and Kington District.	0	0	0		
Coleshill District	0	0	0		
Coventry District	0	0	0		
Henley District	0	0	0		
Kenilworth District	0	0	0		
Rugby District	0	0	0		
Solihull District	0	0	0		
Southam District	0	0	0		
Stratford and Snitterfield District	0	0	0		
Warwick District	0	0	0		
WESTMORLAND:					
Ambleside District	0	0	0		
East Ward District	0	0	0		
Kendal Ward District	0	0	0		
Lonsdale Ward District	1	0	0	License refused on the ground that the house is unnecessary for the public requirements in the district.	Appeal withdrawn before trial.
West Ward District	0	0	0		
WILTS					
Bradford District	1	0	0	Holder omitted to apply for renewal at general annual licensing meeting, 31st August 1892.	Application made at special sessions by new occupier, 28th December 1892, under 9 Geo. 4, c. 61, s. 14, and license granted.
Calne District	0	0	0		
Chippenham District	0	0	0		
Cricklade District	0	0	0		
Devizes District	0	0	0		
Evesley and Pewsey District	0	0	0		
Malmesbury District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
WILTS—*continued.*					
Marlborough and Hungerford District.	0	0	0		
Melksham District	0	0	0		
Salisbury and Amesbury District	0	0	0		
Swindon District	0	0	0		
Tisbury and Mere District	0	0	0		
Trowbridge District	0	0	0		
Warminster District	0	0	0		
Westbury District	0	0	0		
Whorwellsdown District	0	0	0		
WORCESTERSHIRE:					
Blockley District (Shipton Division).	0	0	0		
Blockley District (Chipping Campden Division).	0	0	0		
Bromsgrove District	0	0	0		
Droitwich District	0	0	0		
Evesham District	0	0	0		
Halesowen District	1	1	0	*Victuallers' License.*—That the licensed premises were not then and had not for some time been opened or used as a public-house, and that the license was not required in the district. *Beerhouse License.*—That the licensed premises were not then and had not for some time been opened or used for that purpose, and that the license was not required.	No appeal. - ditto
Hundred House District	0	0	0		
Kidderminster District	0	0	0		
Malvern, Great, District	0	0	0		
Northfield District	0	0	0		
Oldbury District	0	0	0		
Pershore District	0	0	0		
Redditch District	0	0	0		
Stourbridge District	0	0	0		
Stourport District	0	0	0		
Tenbury District	0	0	0		
Upton-on-Severn District	0	0	0		
Worcester District	0	0	0		
YORKSHIRE:					
EAST RIDING:					
Bainton Beacon District	0	0	0		
Buckrose District	0	0	0		
Dickering District	0	0	0		
Holderness, Middle, District	0	0	0		
„ North, District	0	0	0		
„ South, District	0	0	0		
Holme Beacon District	0	0	0		
Howdenshire District	0	0	0		
Hunsley Beacon, North, District	0	0	0		
„ South, District	0	0	0		
Ouse and Derwent District	0	0	0		
Wilton Beacon District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
YORKSHIRE—*continued.*					
NORTH RIDING:					
Allertonshire District	0	0	0		
Birdforth District	0	0	0		
Bulmer, East, District	0	0	0		
,, West, District	0	0	0		
Gilling, East, District	0	0	0		
,, West, District	0	0	0		
Greta Bridge District	0	0	0		
Hallikeld District	0	0	0		
Hang, East, District	0	0	0		
,, West, District	0	0	0		
Langbaurgh, East, District	0	0	1	Because no intoxicating liquor had been sold on the premises, nor any excise license taken out during the preceding 12 months.	
,, North, District	0	0	0		
,, West, District	0	0	0		
Malton District	0	0	0		
Pickering Lythe, East, District	0	0	0		
,, West, District	0	0	0		
Ryedale District	0	0	0		
Whitby Strand District	2	0	0	Licenses not required	No appeal.
Yarm District	0	0	0		
WEST RIDING:					
Agbrigg, Lower, District	0	0	0		
,, Upper, District	0	0	0		
Ainsty, Eastern, District	0	0	0		
Barkston Ash, Upper, District	0	0	0		
,, Lower, District	0	0	0		
Bolton-by-Bowland District	0	0	0		
Claro District	0	0	0		
Dewsbury District	0	0	0		
Ewcross District	0	0	0		
Keighley District (Keighley Division).	0	0	1	Not required by the neighbourhood.	No appeal.
Keighley District (Bingley Division).	0	0	0		
Kirkby Malzeard District	0	0	0		
Morley, East, District	0	0	0		
,, West, District	0	0	0		
Osgoldcross, Lower, District	0	0	1 (Beer off-license.)	Not required; sufficient in the neighbourhood without it.	
,, Upper, District	0	0	0		
Otley District	0	0	0		
Saddleworth District	1	0	0	That the license was not required, and that two convictions (ordered not to be endorsed on the license) were recorded against the tenant.	The appeal was allowed, and the license renewed by the quarter sessions.
Skyrack District	0	0	0		
Stainecliffe, East, District	0	0	1 (Beer-house licensed to sell wine on.)	License not required	No appeal.
,, West, District	0	0	0		
Staincross District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
YORKSHIRE—*continued.*					
WEST RIDING—*continued.*					
Strafforth, Lower, and Tickhill District	1	0	0	The holder of the license applied for a renewal; but as he had been twice, within a period of three months, convicted of permitting drunkenness on his licensed premises, the justices were of opinion that he was not a fit person to hold a license, and refused his application for a renewal.	No appeal.
Strafforth, Upper, and Tickhill District (Rotherham Division).	0	0	0		
Strafforth, Upper, and Tickhill District (Sheffield Division).	0	0	0		
Tadcaster District	0	0	0		
Todmorden District	0	0	0		
Wetherby District	0	0	0		
LIBERTY OF RIPON	0	0	0		
TOTAL for ENGLAND	58	32	11		
WALES:					
ANGLESEY:					
First District, at Menai Bridge and Llangefni	3	0	0	(1.) House not properly conducted. (2.) Not required for convenience of neighbourhood. (3.) Licensee not having lived on the premises for 16 months, and no drink sold during that time.	
Second District, at Amlwch	1	0	0	Death of the old licensee, and that the license was not required for the size of the place.	No appeal.
Second District, at Holyhead and Valley.	0	0	0		
Second District, at Llanerchymedd	1	0	0	Not stated by justices.	
BRECONSHIRE:					
Brynmawr District	0	0	0		
Builth District	0	0	0		
Crickhowell District	0	0	0		
Devynnock District	0	0	0		
Hay District	0	0	0		
Merthyr District	1	0	0	That the license was not required	No appeal.
Penderyn District	1	0	0	Refused on the grounds that such license was not required, and the premises had been used for some time past, and were then used as a private dwelling-house only.	No appeal.
Penkelly District	0	0	0		
Talgarth District	0	0	0		
Ystradgunlais District	0	0	0		
CARDIGANSHIRE:					
Geneurglyn, Lower, District	0	0	0		
„ Upper, District	0	0	0		
Ilar, Lower, and Aberayron District	0	0	0		
Ilar, Upper, District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
WALES—*continued.*					
CARDIGANSHIRE—*continued.*					
Llandyssil District	0	0	0		
Moyddin, Upper, District	0	0	0		
Penarth District	0	0	0		
Penrhiwpal District	0	0	0		
Troedyraur, Lower, District	0	0	0		
CARMARTHENSHIRE:					
Carmarthen District	0	0	0		
Llanboidy District	0	0	0		
Llandilo District	0	0	0		
Llandovery District (Llandovery Division).	0	0	0		
Llandovery District (Llangadock Division).	0	0	0		
Llandovery District (Llansawell and Caio District).	0	0	0		
Llanelly District	0	0	0		
Llanfihangel-ar-Arth District	0	0	0		
Newcastle-Emlyn District	0	0	0		
Saint Clear's District	0	0	0		
CARNARVONSHIRE:					
Bangor District	2	0	0	(1.) Licensee having been convicted within the past year for selling liquors on Sunday against the Sunday Closing (Wales) Act, with license endorsed, and the premises being situated so as not to be sufficiently under police supervision. (2.) Objections to the premises by neighbours, and the person licensed considered immoral.	No appeal. No appeal.
Carnarvon District	4	0	0	Reasons not stated; there were convictions against the houses.	Three appealed, and in one case the decision of the justices was reversed.
Conway District	0	0	0		
Eifionydd District	0	0	0		
Nant Conway District	0	0	0		
Pwllheli District	0	0	0		
DENBIGHSHIRE:					
Bromfield District	0	0	0		
Chirk, Upper, District	0	0	0		
Isaled District	0	0	0		
Isdulas District	0	0	0		
Llangollen District	0	0	0		
Ruabon District	0	0	0		
Ruthin District	0	0	0		
Uwchaled District	0	0	0		
Uwchddulas District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
WALES—*continued.*					
FLINTSHIRE:					
Caerwys District	0	0	0		
Hawarden District	0	0	0		
Holywell District	0	0	0		
Hope District	0	0	0		
Mold District	0	0	0		
Northop District	0	0	0		
Overton District	0	0	0		
Prestatyn District	0	0	0		
Rhuddlan District	0	0	0		
GLAMORGAN:					
Caerphilly, Higher, District	0	0	0		
„ Lower, District	0	0	0		
Cowbridge District	0	0	0		
Dynas Powis District	0	0	0		
Gower District	0	0	0		
Kibbor District	0	0	0		
Miskin, Higher, District	1	0	0	Repeated convictions. Disorderly house.	Rule for mandamus granted and discharged.
Pontypridd District	1	0	0	Convictiens recorded against the license.	
Neath District	0	0	0		
Newcastle District	0	0	0		
Pontardawe District	1	0	0	Offences against the Licensing Acts.	
Swansea District	1	0	0	Convictions under the Licensing Acts.	Decision upheld, on appeal to Quarter Sessions.
MERIONETHSHIRE:					
Ardudwy-is-Artro District	1	0	0	License not required.	
Ardudwy-uwch-Artro District	1	0	0	The application was opposed, on the ground that the premises were not required. At the Brewster Sessions the matter was adjourned to 29th September 1892. After hearing the applicant and opponents, the bench were equally divided as to renewing or refusing the license, and consequently the renewal had to be considered as refused.	
Edernion District	0	0	0		
Estimaner District	0	0	0		
Penllyn District	0	0	0		
Talybont District	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

COUNTIES—*continued.*

LICENSING DISTRICT.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
WALES—*continued.*					
MONTGOMERYSHIRE:					
Caurse District	0	0	0		
Deythur District	0	0	0		
Llanfyllin District	0	0	0		
Llanidloes, Lower, District	0	0	0		
„ Upper, District	0	0	0		
Machynlleth District	0	0	0		
Mathrafas District	0	0	0		
Montgomery, Lower, District	0	0	0		
Newtown, Lower, District	0	0	0		
„ Upper, District	0	0	0		
Pool, Lower, District	0	0	0		
„ Upper, District	0	0	0		
PEMBROKESHIRE:					
Castlemartin District	0	0	0		
Dewsland District	0	0	0		
Dungleddy District	0	0	0		
Kemes District	0	0	0		
Kilgerran District	0	0	0		
Narberth District	2	0	0	(1.) No required; the business had not been carried on for 12 months; the premises were inappropriate.	No appeal.
				(2.) Application under 9 Geo. 4, c. 61, by a new tenant; an outgoing tenant having neglected to apply, refused; no grounds given.	Ditto.
Roose District	0	0	0		
RADNORSHIRE:					
Cefnllys District	0	0	0		
Colwyn District	0	0	0		
Knighton District	0	0	0		
Painscastle District	0	0	0		
Presteign District	0	0	0		
Radnor, New, District	0	0	0		
Rhayader District	0	0	0		
TOTAL FOR WALES	21	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS.

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND:					
Abingdon	0	0	0		
Accrington	0	0	0		
Andover	1	0	0	Objected to by superintendent of police on account of previous conviction for permitting drunkenness.	Appeal dismissed, with costs.
Ashton-under-Lyne	0	0	0		
Banbury	0	0	0		
Barnstaple	0	0	0		
Barrow-in-Furness	0	0	0		
Basingstoke	0	0	0		
Bath	0	0	0		
Batley	0	0	0		
Bedford	0	0	0		
Berwick-upon-Tweed	0	0	0		
Beverley	0	0	0		
Bewdley	1	0	0	License not required by reason of the holder having closed his house to the public for 12 months, and not having taken out excise license during that period.	
Bideford	0	0	0		
Birkenhead	1	0	0	Not required.	
Birmingham	1	2	0	*Victuallers' License.*—Character, convicted of offence under Licensing Acts, and license not required.	No appeal.
				Beerhouse License.—Character, convicted of offences under Licensing Acts.	One appeal dismissed, the other, no appeal.
Blackburn	0	0	0		
Bodmin	0	0	0		
Bolton	0	0	0		
Bootle	0	0	0		
Boston	1	0	0	Convictions for harbouring prostitutes under Section 14 of the Licensing Acts, 1872. Premises not conducted in an orderly and proper manner, and license not required.	
Bradford	3	4	5	*Victuallers' Licenses.*—Houses pulled down for street improvements. *Beerhouses.* — Houses pulled down for street improvements. *Other Licenses.*—No necessity.	
Bridgnorth	0	0	0		
Bridgwater	0	0	0		
Bridport	0	0	0		
Brighton	1	0	0	The greater portion of the house, licensed as a hotel, had been appropriated to other use, leaving only the shades, the renewal to which was refused.	No appeal.
Bristol, City and County of	2	8	0	*Victuallers' Licenses.* — (1.) Applicant failed to produce satisfactory evidence of good character; house not required. (2.) House pulled down; not required. *Beerhouses.*—(1.) Licensee not duly qualified as by law is required; house not required. (2.) Premises and licensee not duly qualified as by law is required; house not required. (3.) (4.) House pulled down; not required. (5, 6, 7, 8.) Applicant failed to produce satisfactory evidence of good character; house not required.	Appeals to Quarter Sessions and Queen's Bench Division, dismissed with costs.

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS—*continued.*

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
Buckingham	0	0	0		
Burnley	0	1	0	That the house was disorderly and was frequented by persons of bad character.	License granted by Court of Quarter Sessions.
Burton-on-Trent	0	0	0		
Bury (Lancs.)	0	0	0		
Bury St. Edmunds	0	0	0		
Cambridge	0	0	0		
Canterbury	0	0	0		
Carlisle	1	0	0	Four convictions within five years (two of them within 12 months). *Note.*—Only two of the convictions were endorsed on the license.	No appeal.
Chester	0	0	1 (Off Beer, Wine, and Spirit License.)	The premises were not occupied by a *bonâ fide* tenant and occupier.	No appeal.
Chesterfield	0	0	0		
Chichester	0	0	0		
Chipping Wycombe	0	0	0		
Clitheroe	0	0	0		
Colchester	0	0	0		
Congleton	0	0	0		
Coventry	0	0	0		
Crewe	0	0	0		
Croydon	0	1	0	Partly misconduct; partly not required.	Notice of appeal given, but abandoned.
Darlington	0	0	0		
Dartmouth	0	0	0		
Deal	0	0	0		
Derby	1	0	0	Permitting premises to be a brothel.	
Devizes	0	0	0		
Devonport	0	0	0		
Dewsbury	0	0	0		
Doncaster	0	0	2	The premises long since ceased to be used for sale of beer; the renewal of license objected to on ground that no Excise License taken out in respect of same.	
Dorchester	0	0	0		
Dover (including the Liberties of the Cinque Port of Dover).	0	0	0		
Droitwich	0	0	0		
Dudley	0	0	0		
Dunstable	0	0	0		
Durham	0	0	0		
East Retford	1	0	0	The magistrates refused the renewal of this license on the ground of its not being required, which was shown by the fact of the premises being used as a jeweller's shop, and that the Excise License had not been taken out for a considerable number of years. There was no appearance at the Brewster Sessions by or on behalf of the holder of the license.	No appeal.
Evesham	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS—*continued.*

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
Exeter	0	0	0		
Eye	0	0	0		
Falmouth	0	0	0		
Faversham	0	0	0		
Folkestone	0	1	0	The license was not required for the accommodation of the public.	No appeal.
Gateshead	0	0	0		
Glossop	0	0	0		
Gloucester	1	0	0	Harbouring prostitutes	Dismissed with costs.
Godalming	0	0	0		
Grantham	0	0	0		
Gravesend	0	0	0		
Grimsby	0	0	0		
Guildford	0	0	0		
Halifax	0	0	0		
Hanley	0	0	0		
Harrogate	0	0	0		
Hartlepool	0	0	0		
Harwich	0	0	0		
Hastings	0	0	1 (strong beer dealer's retail license under 26 & 27 Vict. c. 33).	On the ground that the applicant for renewal of the license was not in fact either owner or tenant, but the servant of the real owner of the business.	No appeal.
Helston	0	0	0		
Henley-on-Thames	1	0	0	That it was not required for the wants of the neighbourhood.	
Hereford	0	0	0		
Hertford	0	0	0		
Heywood	0	0	0		
Huddersfield	0	0	0		
Hythe	0	0	0		
Ipswich	1	0	0	That the license was not required.	No appeal.
Jarrow	0	0	0		
Kendal	0	0	0		
Kidderminster	0	0	1	House void, and license not required.	
King's Lynn	0	0	0		
Kingston-upon-Hull	1	1	0	*Victualler's License:* On account of the license having been endorsed during the previous licensing year, and that the license was not required by the necessities of the neighbourhood.	No appeal.
				Beerhouse License: Refused on the ground that during the previous licensing year proceedings had been taken against the licensee, the bad character of the house, and that the license was not required by the necessities of the neighbourhood.	No appeal.
Kingston-on-Thames	0	0	0		
Lancaster	0	0	0		
Launceston	0	0	0		
Leamington	0	0	1 (grocer's license).	Refused on the ground that there was no tenant in possession to make application.	

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS—*continued.*

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
Leeds	1	1	4	*Victualler's License:* A conviction recorded, and no public necessity for the license. *Beerhouse License:* A conviction recorded on the license, and house of a disorderly character, and frequented by thieves, prostitutes, and persons of bad character. *Note.*—This house was licensed in 1869, and previously. *Other Licenses:* 1. A conviction recorded on the license, and no public necessity for the license. 2. Applicant not the real resident holder and occupier of the premises, and no public necessity for the license. 3 and 4. No public necessity for the license.	Appeal dismissed with costs.
Leicester	1	0	5 (Beer "off" licenses).	*Victualler's License:* Premises uninhabitable. *Beer (Off) Licenses:* 1 and 2. Holders of licenses not being the real resident occupiers. 3, 4, and 5. Licenses not required by the inhabitants of the neighbourhood.	No appeal. No appeal. No appeal.
Leominster	0	0	0		
Lichfield	1	0	0	License holder convicted of an offence against the Licensing Acts, 1872 and 1874, and that the license was not necessary for the requirements of the neighbourhood.	
Lincoln	0	0	0		
Liskeard	0	0	0		
Liverpool	11	2	0	*Victuallers' Licenses:* Police objections, resort of prostitutes, licensee not a fit person, and license not required (5). Police objections, immoral conduct in house, house badly conducted, licensee not a fit person, and license not required (2). Police objection, taking workmen's tallies as security for drink, not a fit person, and license not required (1). Private objection, structurally bad, and license not required, and house a bad reputation (1). Police objections, house had been closed, and license not required (1). Private objection, house had been closed, and license not required (1). *Beerhouse Licenses:* Police objection, police not proper supervision because of building, and license not required (1). Private objection, house of a disorderly character where young people meet, and license not required (1).	Seven appeals, six being refused and one allowed.

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS—*continued.*

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
Longton	0	0	0		
Louth	0	0	0		
Ludlow	0	0	0		
Luton	0	1	0	License objected to as unnecessary, and not required in the neighbourhood where house was situate, and renewal of same refused.	No appeal.
Lydd	0	0	0		
Lyme Regis	0	0	0		
Lymington	0	0	0		
Macclesfield	0	0	0		
Maidenhead	0	0	0		
Maidstone	0	0	0		
Maldon	0	0	0		
Manchester	8	41	0	*Victuallers' Licenses.*—1 to 3, character; 4 to 8, ceased to be used. *Beerhouse Licenses.*—*1 to 20, character; †21 to 41, ceased to be used.	One appeal granted.
Margate	0	0	0		
Marlborough	0	0	0		
Middlesbrough	0	0	1	Not required	No appeal entered.
Middleton	0	0	0		
Monmouth	0	0	0		
Morley	0	0	0		
Mossley	0	0	0		
Nelson	0	0	0		
Newark	0	0	0		
Newbury	0	0	0		
Newcastle-under-Lyme	0	0	0		
Newcastle-upon-Tyne ‡	5	1	0	*Victuallers' Licenses:* (1.) Two convictions against tenor of license, and license not required in the district in which licensed premises are situated.	Appeal dismissed.
				(2.) Conviction against tenor of license, licensed premises kept and used otherwise than as a restaurant, in contravention of undertaking given when license last renewed, and license not required in the district, &c.	No appeal.
				(3.) Three convictions against tenor of license; house frequented by prostitutes and disorderly characters, and is a source of drunkenness and disorder in the neighbourhood, and license not required in the district, &c.	ditto.
				(4.) Three convictions against tenor of license, and license not required in the district, &c.	Renewed on appeal (by consent of justices on terms).
				(5.) Conviction against tenor of license; house closed, and not used as an alehouse, and license not required in the district, &c.	Appeal dismissed.
				Beerhouse License: (1.) Not carrying on the business of a beerhouse keeper, and licensed premises not used as a beerhouse since license granted.	No appeal.
Newport (Isle of Wight)	0	0	0		
Newport (Monmouthshire)	0	0	0		

* Of these 11 since granted to new tenants.

† Of these four since granted to new tenants.

‡ The clerk to the justices remarks that the various objections to the renewal are in each case set out, and it will be observed that in no instance did the alleged fact of the house not being required form the sole objection. Except in the case of "protected beerhouses," the justices are under no obligation to state the grounds of their refusal, and in no instance must it be inferred that the license was refused simply on the ground that it was not required. The notices of objection were, in all cases, given by the police, the justices not taking the initiative, but considering judicially the several objections.

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS—*continued.*

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
Northampton	0	0	0		
Norwich	2	0	0	(1.) The house had ever since the license was granted been used as a grocer's shop, and intoxicating liquors were occasionally sold under a full license, but mainly for out-door consumption; the licensed holder during the year 1892, prior to the Licensing Session, shut off a portion of the grocer's shop and provided beer engines for a drinking bar. The license was refused on the ground that such a drinking bar was not required by the public and was undesirable. (2.) Habitual and notorious resort of prostitutes.	Refusal confirmed on appeal to County Quarter Sessions.
Nottingham	0	0	0		
Oldham	0	0	0		
Oswestry	0	0	0		
Over Darwon	0	0	0		
Oxford	0	0	0		
Penryn	0	0	0		
Penzance	0	0	0		
Plymouth	0	0	0		
Pontefract	0	0	0		
Poole	0	0	0		
Portsmouth	0	0	0		
Preston	0	0	0		
Reading	0	0	0		
Ramsgate	0	0	0		
Reigate	0	0	0		
Richmond (Surrey)	0	0	0		
Richmond (Yorkshire)	0	0	0		
Ripon	0	0	0		
Rochdale	0	2	0	That houses not of annual value required by law, viz., not of annual value of 15*l.*	The license of one house was renewed on appeal, the Quarter Sessions being of opinion that house was of more than annual value of 15*l.*
Rochester	0	0	0		
Romney, New	0	0	0		
Romsey	0	0	0		
Rotherham	0	0	0		
Ryde	0	0	0		
Rye	1	0	0	License (on transfer) refused on the ground that the house was not required, and that it had been the resort of criminals and disorderly characters.	The Court of Quarter Sessions for East Sussex considered there was not sufficient evidence to justify the refusal of the transfer. Appeal allowed and transfer granted by Quarter Sessions.
Saffron Walden	0	0	0		
St. Albans	0	0	0		
St. Helens	0	0	0		
St. Ives (Cornwall)	1	0	0	On the ground that the premises had not been used for some years for the sale of intoxicating liquors, and not being required, the number of houses being in excess of the requirements of the neighbourhood.	

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS—*continued.*

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
Salford	1	5 (One in-door beerhouse; four out-door beer-houses.)	1 (Wine license, off.)	*Victualler's License.* — That the licensed premises had ceased to be used for the purposes for which they were licensed, the same having been demolished.	No appeal.
				In-door Beerhouse. — That the licensed premises were closed and unoccupied, and had ceased to be used for the purposes for which they were licensed.	No appeal.
				Out-door Beerhouses (3).—Conviction for Sunday trading, and license endorsed, and that the requirements of the neighbourhood were amply supplied without these licenses.	Two appeals allowed.
				Out-door Beerhouse.—Conviction for Sunday illegal trading, and license endorsed.	
				Wine License.—That the licensed premises had ceased to be used for the purposes for which they were licensed, and that no license could be found.	No appeal.
Salisbury	0	0	0		
Sandwich	0	0	0		
Scarborough	0	0	0		
Sheffield	0	0	0		
Shrewsbury	0	0	0		
Southampton	0	1	0	Disorderly house	Appeal dismissed, with costs, subject to special case stated for opinion of Queen's Bench.
South Molton	0	0	0		
Southport	0	0	0		
South Shields	1	0	0	That the house was in a dilapidated condition, not needed in the locality, and visited by disorderly characters.	Appealed against to Durham Quarter Sessions, 17th October 1892. Appeal dismissed, and Licensing Justices' decision upheld.
Southwold	0	0	0		
Stafford	0	0	0		
Stalybridge	0	0	0		
Stamford	0	0	0		
Stockport	0	0	0		
Stockton-on-Tees	0	0	0		
Stratford-upon-Avon	0	0	0		
Sudbury	0	0	0		
Sunderland	2	1	0	*Victuallers' Licenses.*—(1.) House unnecessary, been closed since December 1891. Last tenant convicted and fined in 1891. (2.) House unnecessary, and unfit for licensed premises. Last tenant convicted. *Beerhouse.*—Applicant not of good character; convicted in February 1892.	
Sutton Coldfield	0	0	0		
Tamworth	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS—*continued.*

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal, especially when such Ground was, in any instance, that the License was not Required.	Result of Appeal (if any).
ENGLAND—*continued.*					
Tenterden	0	0	0		
Tewkesbury	0	0	0		
Thetford	0	0	0		
Tiverton	0	0	0		
Torrington, Great	0	0	0		
Totnes	0	0	0		
Truro	0	0	0		
Tynemouth	0	0	0		
Wakefield	0	0	1	License not used and not required	
Wallingford	0	0	0		
Walsall	0	0	0		
Warrington	0	0	0		
Warwick	0	0	0		
Wells	0	0	0		
Wenlock	0	0	0		
West Bromwich	0	0	0		
West Ham	0	0	0		
Weymouth and Melcombe Regis	0	0	0		
Wigan	0	0	0		
Winchester	0	0	0		
Windsor	0	0	0		
Wisbech	0	0	0		
Wolverhampton	1	0	0	House the habitual resort of prostitutes; and general bad character.	No appeal.
Worcester	0	0	0		
Yarmouth, Great	0	0	0		
Yeovil	0	0	0		
York	0	0	0		
TOTAL FOR ENGLAND	54	73	23		
WALES:					
Aberavon	0	0	0		
Aberystwith	0	0	0		
Brecon	0	0	0		
Cardiff	0	0	0		
Cardigan	0	0	0		
Carmarthen	0	0	0		
Carnarvon	0	1	0	The grounds upon which this license was opposed, were as follows:— That the house to which such license is attached is a tied house. That the said house is not of the annual value prescribed by the Licensing Acts. That licensee was not a fit and proper person to hold such license. That the said house is difficult of proper police supervision. That the said house is not required by the character and necessities of the neighbourhood. The justices refused the license, but did not state upon which of such grounds they did so, nor were they asked to give the grounds of their refusal.	
Denbigh	0	0	0		
Flint	0	0	0		

Number of Victuallers', Beerhouse, and other Licenses for the Sale of Intoxicating Liquors, &c.—*continued.*

BOROUGHS—*continued.*

BOROUGH.	Number of Victuallers' Licenses.	Number of Beerhouse Licenses.	Number of other Licenses.	Ground of Refusal especially when such Ground was, in any instance, that the License was not required.	Result of Appeal (if any).
WALES—*continued.*					
Haverfordwest - - - -	2	0	0	Not required, there being sufficient accommodation in the district; in one instance the house was also badly conducted.	
Pembroke - - - - -	0	0	0		
Swansea - - - - -	2	0	0	(1.) Refused on the ground that the house was taken down by the owner, and that there was no house in existence to license. (2.) Refused on the ground of offences against the Licensing Acts, and that license was not required.	Decision of justices upheld at Quarter Sessions.
Tenby - - - - - -	0	0	0		
Welshpool - - - - -	1	0	0	Not required by the neighbourhood.	
Wrexham - - - - -	0	0	0		
TOTAL FOR WALES - -	5	1	0		

SUMMARY.

	Number of Victuallers' Licenses refused in 1892.	Number of Beerhouse Licenses refused in 1892.	Number of other Licenses refused in 1892.
COUNTIES, ENGLAND - - - - - - - - - -	58	32	11
„ WALES - - - - - - - - - -	21	0	0
TOTAL, COUNTIES - - - -	79	32	11
BOROUGHS, ENGLAND - - - - - - - - -	54	73	23
„ WALES - - - - - - - - - -	5	1	0
TOTAL, BOROUGHS - - -	59	74	23
GRAND TOTAL, ENGLAND AND WALES - -	138	106	34

INTOXICATING LIQUORS (LICENSES REFUSED).

RETURN of the Number of VICTUALLERS', BEER-HOUSE, and other LICENSES for the Sale of INTOXICATING LIQUORS, the Renewal of which has been Refused, in the Year 1892, by the JUSTICES OF THE PEACE in each LICENSING DISTRICT in *England* and *Wales*, showing in each case the Ground of Refusal, especially when such Ground was in any instance that the License was not Required; and showing also the Result of Appeal, if any (in continuation of Parliamentary Paper, No. 262 of Session 1892).

(*Mr. John Ellis.*)

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4 *July* 1893.

[*Price* 3½*d.*]

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PAWNBROKERS (IRELAND).

RETURN to an Order of the Honourable The House of Commons, dated 20 February 1893;—*for*,

RETURN "showing (1) the Number of Licensed Pawnbrokers in each City and Town in *Ireland*, distinguishing those qualified to deal in Plate and Jewelry, or if any available Record of such exists; (2) Cities and Towns in which Forfeited Pledges have not been disposed of by Public Auction, as by Law required, within the past (a) Ten Years, (b) Five Years, (c) Twelve Months; and (3) the Number of Prosecutions instituted within the past Ten Years against Pawnbrokers who have failed to comply with the Law respecting the sale of Forfeited Pledges, with the Result of such Prosecutions."

(*Mr. Dane.*)

Ordered, by The House of Commons, *to be Printed*,
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RETURN showing (1) the Number of Licensed Pawnbrokers in each City and Town in *Ireland*, distinguishing those qualified to deal in Plate and Jewelry, or if any available Record of such exists; (2) Cities and Towns in which Forfeited Pledges have not been disposed of by Public Auction, as by Law required, within the past (a) Ten Years, (b) Five Years, (c) Twelve Months; and (3) the Number of Prosecutions instituted within the past Ten Years against Pawnbrokers who have failed to comply with the Law respecting the sale of Forfeited Pledges, with the Result of such Prosecutions.

(1) RETURN showing the Number of Licensed Pawnbrokers in each City and Town in *Ireland*, distinguishing those qualified to deal in Plate and Jewelry.

NAME OF CITY OR TOWN.	Number of Licensed Pawnbrokers.			NAME OF CITY OR TOWN.	Number of Licensed Pawnbrokers.		
	Licensed to deal in Plate and Jewelry.	Not Licensed to deal in Plate and Jewelry.	TOTAL.		Licensed to deal in Plate and Jewelry.	Not Licensed to deal in Plate and Jewelry.	TOTAL.
Antrim	–	1	1	Kilkenny City	6	4	10
Ardee	–	1	1	Kilrea	–	1	1
Armagh	1	1	2	Kiltimagh	–	1	1
Athlone	2	–	2	Kingstown	2	–	2
Athy	1	1	2	Kinsale	2	–	2
Bagnalstown	–	1	1	Kilrush	–	1	1
Ballaghaderreen	–	1	1	Larne	–	2	2
Ballina	1	1	2	Ligoniel	1	1	2
Ballinasloe	1	–	1	Limavady	–	1	1
Ballinrobe	–	1	1	Limerick City	8	7	15
Ballyhaunis	–	1	1	Lisburn	3	–	3
Ballymena	2	–	2	Listowel	–	1	1
Ballymoney	–	1	1	Lismore	1	–	1
Ballyshannon	–	2	2	Longford	1	1	2
Banbridge	–	2	2	Londonderry City	5	5	10
Bandon	–	1	1	Lurgan	2	3	5
Belfast	76	24	100	Magherafelt	1	–	1
Birr	1	1	2	Mallow	2	–	2
Blackrock (Dublin)	1	1	2	Maryborough	–	1	1
Bray	3	–	3	Midleton	2	–	2
Boyle	–	1	1	Mitchelstown	1	–	1
Cahir	–	2	2	Monaghan	1	–	1
Cappoquin	2	–	2	Mountmellick	–	1	1
Carlow	1	2	3	Mullingar	2	–	2
Carrick-on-Suir	–	2	2	Naas	1	1	2
Cashel	–	2	2	Navan	1	–	1
Cavan	–	1	1	Nenagh	1	–	1
Castlebar	–	1	1	Newcastle W.	–	1	1
Castlerea	–	1	1	Newbridge	3	–	3
Celbridge	1	–	1	Newry	2	2	4
Charlestown	–	1	1	New Ross	–	1	1
Charleville	1	–	1	Newtownards	1	1	2
Clifden	–	1	1	Newtownbarry	–	1	1
Clonakilty	2	–	2	Omagh	2	–	2
Clonmel	5	1	6	Passage (Cork)	2	–	2
Coleraine	2	1	3	Portadown	2	1	3
Cookstown	–	3	3	Portarlington	–	1	1
Cootehill	–	1	1	Queenstown	4	1	5
Cork City	10	13	23	Rathfriland	–	1	1
Donaghadee	–	1	1	Rathkeale	–	1	1
Downpatrick	–	1	1	Roscrea	–	2	2
Drogheda	3	3	6	Skibbereen	1	–	1
Dromore	1	–	1	Sligo	3	–	3
Dundalk	2	3	5	Strabane	3	–	3
Dungannon	–	1	1	Swinford	–	2	2
Dungarvan	1	–	1	Thurles	1	2	3
Durrow	–	2	2	Templemore	–	1	1
Dublin City	49	1	50	Tipperary	1	2	3
Edenderry	–	2	2	Tralee	2	1	3
Ennis	3	–	3	Trim	1	–	1
Enniscorthy	1	1	2	Tuam	–	2	2
Enniskillen	2	–	2	Tullamore	1	2	3
Ennistymon	–	1	1	Tullow (Co. Carlow)	–	1	1
Fermoy	–	1	1	Waterford	2	3	5
Fintona	–	1	1	Westport	–	2	2
Galway	2	2	4	Wexford	1	2	3
Gorey	–	1	1	Wicklow	1	1	2
Kanturk	–	1	1	Youghal	2	–	2
Kells	–	1	1				
Killarney	–	1	1				
Kilcullen	–	1	1	TOTAL	255	165	420
Kilkelly	–	1	1				

(2) RETURN showing the Cities and Towns in which Forfeited Pledges have not been disposed of by Public Auction as by Law required within the past (a) Ten Years, (b) Five Years, and (c) Twelve Months; and (3) the Number of Prosecutions instituted within the past Ten Years against Pawnbrokers who have failed to comply with the Law respecting the Sale of Forfeited Pledges, with the Result of such Prosecutions.

COUNTY.	Names of Cities and Towns in which Forfeited Pledges have not been disposed of by Public Auction during the past			Prosecutions instituted.		
	Ten Years.	Five Years.	Twelve Months.	Convictions.	Dismissals.	Prosecutions.
Antrim	-	-	Ballymoney	-	-	-
	Lisburn	Lisburn	Lisburn	-	-	-
	—	—	Ligoniel	1	-	1
Armagh	Armagh	Armagh	Armagh	-	-	-
	—	Lurgan	Lurgan	-	-	-
	Newry	Newry	Newry	-	-	-
	Portadown	Portadown	Portadown	-	-	-
Carlow	-	Carlow	—	-	-	-
Cavan	Cavan	Cavan	Cavan	-	-	-
	Belturbet	-	-	-	1	1
Clare	Ennis	Ennis	Ennis	-	-	-
	Ennistymon	Ennistymon	Ennistymon	-	-	-
	Kilrush	Kilrush	Kilrush	-	-	-
Cork, East Riding	Fermoy	Fermoy	Fermoy	-	-	-
	Kinsale	Kinsale	Kinsale	-	-	-
	Mallow	Mallow	Mallow	-	-	-
	Mitchelstown	Mitchelstown	Mitchelstown	-	-	
	Doneraile	Doneraile	—	-		
	Youghal	Youghal	Youghal	-	-	-
Down	Newry	Newry	Newry	-	-	-
Kerry	-	Tralee	Tralee	-	-	
	Killarney	Killarney	Killarney	-	-	
Kildare	Celbridge	Celbridge	Celbridge	-	-	-
	Naas	Naas	Naas	-	-	
	Newbridge	Newbridge	Newbridge	-	-	-
King's	Edenderry	Edenderry	Edenderry	-	-	-
	Tullamore	Tullamore	Tullamore	-	-	
Londonderry	-	Kilrea	—	-	-	-
	—	—	Limavady	-	-	-
	Londonderry	Londonderry	Londonderry	-	-	-
	Magherafelt	Magherafelt	Magherafelt	-	-	-
Longford	-	-	Longford	-	-	-
Mayo	-	Ballyhaunis	Ballyhaunis	-	-	-
	Ballinrobe	Ballinrobe	Ballinrobe	-	-	-
	—	—	Swinford	-	-	-
	Charlestown	Charlestown	Charlestown	-	-	-
	—	Kiltemagh	Kiltemagh	-	-	-
Meath	-	-	Trim	-	-	
Queen's	-	Mountmellick	Mountmellick	-	-	-
Roscommon	-	Boyle	Boyle	-	-	
	—	—	Castlerea	-	-	-
Tipperary, North Riding	Templemore	Templemore	Templemore	-	-	-
	Thurles	Thurles	Thurles	-	-	-
Tipperary, South Riding	Tipperary	Tipperary	Tipperary	-	-	
Tyrone	-	Cookstown	—	-	-	-
	—	—	Dungannon	-	-	-
	Coalisland	Coalisland	Coalisland	-	-	-
	—	Omagh	Omagh	-	-	-
Waterford	-	-	Lismore	-	-	-
	Cappoquin	Cappoquin	Cappoquin	-	-	-
	Waterford	Waterford	Waterford	-	-	-
Westmeath	Athlone	Athlone	Athlone	-	-	-
	Mullingar	Mullingar	Mullingar	-	-	-
			TOTAL	1	1	2

Note.—This Return is compiled from information furnished by the Commissioners of Inland Revenue and the City Marshal of Dublin, and from Returns prepared by the Royal Irish Constabulary from data obtained from the pawnbrokers.

Dublin Castle,
1 July 1893.

D. Harrel,
Under Secretary.

PAWNBROKERS (IRELAND).

RETURN showing (1) the Number of Licensed Pawnbrokers in each City and Town in *Ireland*, distinguishing those qualified to deal in Plate and Jewelry, or if any available Record of such exists; (2) Cities and Towns in which Forfeited Pledges have not been disposed of by Public Auction, as by Law required, within the past (a) Ten Years, (b) Five Years, (c) Twelve Months; and (3) the Number of Prosecutions instituted within the past Ten Years against Pawnbrokers who have failed to comply with the Law respecting the sale of Forfeited Pledges, with the Result of such Prosecutions.

(*Mr. Dane.*)

Ordered, by The House of Commons, *to be Printed,*
31 *July* 1893.

[*Price* ½ *d.*]

352. *Under* 1 *oz.*

REVOLVERS (DEATHS AND INJURIES).

RETURN to an Address of the Honourable The House of Commons, dated 21 July 1893;—*for*,

"RETURNS giving Particulars of Cases treated for REVOLVER or PISTOL WOUNDS in HOSPITALS during the Years 1890, 1891, and 1892:"

"Of INQUESTS held during the same Period on the Bodies of Persons Killed by the discharge of Revolvers or Pistols:"

"And, the Number of Persons Sentenced to Death in each of the aforesaid Years for MURDER committed by means of Revolvers."

Home Office,
14 August 1893.

HERBERT J. GLADSTONE.

(*Mr. Herbert Gladstone.*)

Ordered, by The House of Commons, *to be Printed*,
15 *August* 1893.

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RETURN of the Number of Persons suffering from REVOLVER WOUNDS who have been received into the Wards of the various Metropolitan and Provincial Hospitals during the Years 1890, 1891, and 1892.

(1.)—METROPOLITAN HOSPITALS.

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.	Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
St. Bartholomew's Hospital	1892	W. G.	19 Male	No	Accidental	Wound of hand.
	"	S. E.	28 ditto	Yes	Suicidal	Wound of skull and abdomen.
	"	T. H. H.	67 ditto	No	- ditto -	Wound of lower jaw.
	"	P. J.	16 ditto	No	Accidental	Wound of hand; believed pistol to be unloaded.
	"	C. W.	19 ditto	No	- ditto -	Wound of hand; playing with revolver.
Charing Cross Hospital	1890	H. G.	17 Female	No	Homicidal	Right eyeball excised; left facial paralysis.
	1891	E. P.	30 Male	No	Suicidal	Wounds on temple and chest over heart.
	"	T. P.	18 ditto	No	Accidental	Wound of palm; self-inflicted.
	"	A. A.	45 ditto	No	—	Wound of palate.
	1892	Joyce (Police).	– ditto	Yes	Shot by Wentzel.	
	"	Ruhmann	27 ditto	No	- ditto.	
	"	W. R.	24 ditto	No	Accidental (self-inflicted).	Wound of abdomen.
Guy's Hospital	1890	G. R.	15 Male	No	Accidental	Unknown.
	"	R. W.	64 ditto	Yes	- ditto -	Revolver.
	"	E. H.	12 Female	No	- ditto -	- ditto.
	"	E. C.	15 Male	No	- ditto -	- ditto.
	1891	C. G.	50 ditto	No	Suicidal	- ditto.
	"	M. R.	29 ditto	No	Accidental	- ditto.
	"	H. J. H.	12 ditto	Yes	- ditto -	- ditto.
	"	D. D.	22 ditto	No	Suicidal	- ditto.
	"	M. R.	30 ditto	No	Accidental	- ditto.
	"	P. G.	31 ditto	No	- ditto -	- ditto.
	1892	R. S.	26 ditto	Yes	Suicidal	- ditto.
	"	J. S.	17 ditto	No	Accidental	- ditto.
	"	F. J.	20 ditto	No	- ditto -	- ditto.
King's College Hospital	1892	G. S.	23 Male	Yes	Suicidal	A young soldier.
London Hospital	1890	R. G.	18 Male	No	Accidental	By a friend stooping down.
	"	F. J.	17 ditto	No	- ditto -	By himself.
	"	F. R.	18 ditto	No	- ditto -	* Rifle?
	1891	G. S.	19 ditto	No	Suicidal.	
	"	A. H.	18 ditto	No	- ditto.	
	"	B. M.	37 ditto	No	Shot by lunatic.	
	"	G. H.	13 ditto	No	Accidental	By a friend during examination of weapon.
	"	W. W.	19 ditto	No	- ditto -	- - ditto - - ditto.
	"	H. D.	11 ditto	No	- ditto -	- - ditto - - ditto.
	"	L. P.	20 Female	No	Attempted murder.	By her sweetheart.
	1892	S. L.	21 Male	No	Accidental	During examination of weapon.
	"	F. G.	17 ditto	No	- ditto -	- - ditto - - ditto.
	"	E. B.	16 Female	No	- ditto -	Picked up revolver, when it went off.

* From the nature of the wound, it is doubtful what kind of fire-arm was used.

(1.)—METROPOLITAN HOSPITALS—*continued.*

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.	Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
Middlesex Hospital -	1890	F. de G. -	35 Male -	Yes - -	Homicidal -	The man was shot by another man of about own age, both foreigners.
	1892	M. A. -	29 Female -	Yes - -	Suicidal - -	The woman had been an actress; cause of suicide, a love affair; shot with revolver.
St. George's Hospital -	1890	M. C. -	15 Female -	No - -	Accidental -	Wound of finger.
	„	G. D. -	?22 Male -	Yes - -	Suicidal - -	Bullet through brain.
	1891	H. S. -	25 ditto -	No - -	Accidental -	Wound of hand.
	„	E. R. -	24 ditto -	Yes - -	Suicidal - -	Two wounds in head; one went through brain.
	„	M. M. S. -	18 ditto -	Yes - -	Suicidal - -	Bullet through brain.
	„	H. P. -	40 ditto -	Yes - -	- ditto - -	Bullet through heart.
	„	R. W. -	31 ditto -	Yes - -	- ditto - -	Bullet through brain.
	„	A. A. -	22 ditto -	Yes - -	- ditto - -	- - ditto.
	1892	G. J. -	35 ditto -	No - -	Accidental -	Recovered, with loss of thumb.
	„	A. W. -	48 ditto -	Yes - -	Suicidal - -	Bullet through brain.
	„	L. A. -	? ditto -	Yes - -	- ditto - -	- - ditto.
	„	A. P. -	37 ditto -	Yes - -	- ditto - -	- - ditto.
St. Mary's Hospital, Paddington.	1890	J. S. -	26 Male -	No - -	?	
	„	J. S. -	9 ditto -	No - -	Accidental.	
	„	H. H. -	17 ditto -	No - -	- ditto.	
	1891	H. A. -	20 ditto -	No - -	?	
	„	J. H. -	9 ditto -	No - -	Accidental.	
	„	C. F. -	14 ditto -	No - -	- ditto.	
	„	T. S. -	35 —	No - -	- ditto.	
	1892	W. D. -	15 Male -	No - -	- ditto.	
	„	E. C. -	14 ditto -	No - -	- ditto.	
St. Thomas's Hospital -	1891	E. S. -	18 Male -	No - -	Accidental -	Bullet wound of hand from toy pistol.
University College Hospital.	1891	A. E. F. -	50 Female -	No - -	Accidental -	Shot through face and neck by her husband with revolver.
	„	F. B. -	?27 Male -	Yes - -	Suicidal - -	Shot in chest and neck with revolver.
	1892	F. T. -	19 ditto -	Yes - -	- ditto - -	Bullet penetrating brain.
	„	W. B. -	21 ditto -	Under treatment; progressing favourably.	Accidental -	Shot in leg from horse pistol loaded with large shot.
Westminster Hospital -	1890	E. R. -	21 Male -	No - -	Attempted suicide.	Bullet wound of scalp.
	1891	J. C. -	68 ditto -	Yes - -	Suicide - -	Bullet wound in roof of mouth.
German Hospital - -	1892	G. H. -	28 Male -	Yes - -	Suicidal.	
Great Northern Central, Holloway.	1890	W. W. -	36 Male -	Yes - -	Suicidal - -	Revolver shot wound of brain.
	„	J. J. B. -	56 ditto -	No - -	Accidental -	Bullet wound of thigh.
	1891	E. D. -	19 ditto -	No - -	Suicidal - -	Revolver wound of chest.
	„	L. W. -	16 ditto -	No - -	Accidental -	Shot in hand.
	1892	C. H. -	36 ditto -	No - -	- ditto - -	Pistol wound of wrist.

(1.)—METROPOLITAN HOSPITALS—*continued.*

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.		Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
London, North West	1892	F. W.	21	Male	No	Suicidal	
	"	A. H.	45	Female	No	Attempted murder.	
Poplar Hospital	1890	W. S.	24	Male	No	Accidental	Cleaning barrel with loaded chamber.
	1891	—	—	—	—	—	None admitted, but six treated as out-patients for accidental injuries.
	1892	A. R.	24	Male	No	Suicidal	Wound in mouth.
	"	W. M.	16	ditto	No	Accidental	Shot by sister.
	"	A. S.	21	ditto	No	—	
Royal Free Hospital, Gray's Inn-road.	1890	W. C.	41	Male	No	Suicidal.	
	"	A. V.	35	ditto	No	ditto.	
	1891	J. J. T.	14	ditto	No	Accidental	A typical case; lad stole money from parents, ran away from home in Lancashire, came to London, bought revolver, which went off in his pocket while on an omnibus.
	"	F. W.	23	ditto	No	Suicidal	A clerk; shot in temple.
	"	M. W.	27	Female	Yes	Homicidal	Husband shot himself and wife; both killed.
	1892	S. E. L.	21	Male	Yes	Suicidal	A butcher.
West Ham Hospital	1892	S. M.	24	Male	No	Suicidal	Had been in trouble; love affair.
	"	T. A.	4	ditto	No	Accidental	Elder brother playing with a small revolver.
West London Hospital	1890	G. W.	30	Male	No	Not recorded	Pistol-shot; finger.
	"	J. B.	19	ditto	No	ditto	Shot in hand.
	1891	B. F.	20	Female	No	Accidental	Revolver wound in forehead.
	"	W. H. S.	31	Male	Yes	Not recorded	Bullet wound in head.
	"	C. H. B.	19	ditto	No	ditto	Bullet wound in hand.
	"	W. G.	17	ditto	No	ditto	Pistol-shot in arm.
	"	H. F. H.	13	ditto	No	ditto	Pistol-shot in hand.
	"	F. M.	16	ditto	No	Accidental	Revolver wound in buttock.
	1892	G. P.	6	ditto	No	ditto	Bullet wound in mouth.
	"	E. W. B.	42	ditto	No	ditto	Bullet wound in hand.
	"	J. C.	18	ditto	No	Accidental.	
	"	H. B.	15	ditto	No	Not recorded	Bullet would in hand.
	"	E. H.	13	Male	No	ditto	Bullet wound in hand.
	"	A. L.	19	Female	No	ditto.	
	"	D. R.	25	Male	Yes	Accidental	Revolver wound in abdomen.
	"	J. M.	17	ditto	No	Not recorded	Bullet wound in hand.

(2.)—PROVINCIAL HOSPITALS.

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.	Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
BEDFORDSHIRE:						
Bedford General Infirmary	1891	L. M.	22 Female	Yes	Suicidal.	
CHESHIRE:						
Macclesfield General Infirmary.	1890	A. H.	16 Male	No	Accidental	Self-inflicted. He was showing some boys how to use revolver, and accidentally shot himself in the cheek.
Stockport Infirmary	1890	W. D.	26 ditto	No	ditto.	
	„	J. K.	16 ditto	No	ditto.	
	1891	W. H.	14 ditto	No	ditto.	
	1892	M. H.	23 Female	No	Attempted murder.	Wound inflicted by man, aged 26.
	„	J. B.	26 Male	No	Suicidal	After shooting at the foregoing female, tried to shoot himself.
	„	J. T.	29 ditto	No	Homicidal	Man aged 24 when drunk fired at several people.
DERBYSHIRE:						
Derbyshire Royal Infirmary	1892	J. S.	15 Male	Yes	Accidental	The wound was inflicted by himself. He had shot at a bird, but on pulling the trigger the pistol would not go off. On turning the muzzle towards himself to examine it the pistol suddenly went off.
DURHAM:						
Hartlepools Hospital	1890	R. P.	23 Male	Yes	Suicidal.	
	1891	M. G.	24 ditto	Yes	ditto.	
Sunderland Infirmary	1892	G. S.	18 Female	No	Accidental	Revolver was the property of a sailor and he lent it to girl.
Stockton-on-Tees Surgical Hospital.	1891	R. H. F.	18 Male	No	ditto	A youth playing with a small revolver, practising shooting over his back, and with face to mirror.
ESSEX:						
Essex and Colchester General Hospital.	1890	G. T.	25 Male	No	Accidental.	
	1891	F. H.	20 ditto	No	ditto.	
	„	T. B.	18 ditto	No	ditto.	
	„	A. R.	14 ditto	No	ditto.	
GLAMORGAN:						
Glamorgan and Monmouth Infirmary.	1890	H. S.	43 Male	No	Accidental.	
	„	R. D.	65 ditto	No	Suicidal.	
	„	B. C.	16 Female	No	Accidental.	
	„	A. R.	37 Male	No	—	
	1891	M. A.	15 ditto	No	Accidental.	
	„	D. L.	22 ditto	No	ditto.	
	„	E. D.	41 Female	No	ditto.	
	1892	C. S.	22 Male	No	ditto.	
	„	W. I.	20 ditto	No	Suicidal	
Swansea Hospital	1890	E. S.	26 ditto	No	ditto	Wound of head (revolver).
	„	C. M.	18 ditto	No	Accidental	Wound of shoulder (revolver).
	1891	T. D.	19 ditto	No	ditto	Wound of hand (revolver).
	„	W. M.	52 ditto	Yes	ditto	Wound of chest (revolver).
	1892	E. W.	39 Female	No	ditto	ditto — ditto.

(2.)—PROVINCIAL HOSPITALS—*continued.*

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.	Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
GLOUCESTERSHIRE:						
Bristol Royal Infirmary	1890	F. D.	17 Male	No	Accidental	Self inflicted.
	„	A. L.	15 ditto	No	ditto	Shot by another boy.
	„	G. T.	19 ditto	No	ditto	Self-inflicted (pistol loaded with small shot).
	1891	J. C.	2 ditto	No	ditto?	Shot by a boy (pistol loaded with small shot).
	„	T. B.	14 ditto	No	Suicidal.	
	1892	—	30 ditto	Yes	ditto.	
	„	A. B.	50 Female	No	Accidental	Revolver fired by son, æt. 25.
Bristol General Hospital	1890	C. P.	18 Male	No	ditto.	
	1891	A. C.	18 ditto	Yes	ditto	The boy who accidentally shot A. C. was same age.
	1892	J. C.	30 ditto	No	Suicidal.	
Cheltenham General Hospital.	1892	A. L.	24 ditto	No	ditto	Deliberate attempt at suicide, this man having discharged two barrels of a revolver into his head. Discharged March 1893, with loss of sight, taste, and smell.
HAMPSHIRE:						
Portsmouth Royal Hospital	1890	A. J. C.	35 Male	Yes	Suicidal.	
	1891	G. T.	22 ditto	Yes	Accidental.	
	1892	R. S.	16 ditto	No	ditto	Self-inflicted; considerable loss of power in hand resulted.
	„	G. R.	55 ditto	No	Suicidal.	
Southampton, Royal South Hants Infirmary.	1890	H. G.	16 ditto	No	Accidental.	
	1891	W. H.	22 ditto	Yes	ditto	Revolver, which he thought was unloaded, went off while he was cleaning it.
	1892	A. B.	16 ditto	No	Suicidal	Saloon pistol.
	„	G. H.	23 ditto	No	Accidental	Only slightly injured.
	„	P. R.	18 ditto	No	ditto.	
	„	T. F.	40 ditto	Yes	Suicidal	Shot himself on tram-car.
	„	E. G.	18 ditto	No	Accidental	While examining pistol.
Winchester, Royal Hants County Hospital.	1892	G. M.	14 ditto	No	ditto	Injury to hand (pistol).
HERTFORDSHIRE:						
Hertford General Infirmary.	1890	A. G.	?18 Female	No	Accidental	Two servant girls who were playing with revolver.
HUNTINGDONSHIRE:						
Huntingdon County Hospital.	1890	J. T.	14 Male	No.	—	
KENT:						
St. Bartholomew's Hospital, Rochester.	1892	J. M.	20 Male	No	Intentional	Shot by lad of 19 or 20.
	„	W. C.	37 ditto	Yes	Suicide.	
	„	E. H.	51 Female	No	Attempted murder.	Shot by husband, age 64.
Gravesend Hospital	1890	J. B.	49 Male	No	Homicidal	Injuries from shot fired by the woman's husband.
	„	E. B.	33 Female	No	ditto	
LANCASHIRE:						
District Infirmary, Ashton-under-Lyne.	1892	E. B.	33 Female	No	Homicidal	Shot by husband, age 40.
	„	A. B.	12 Male	No	—	A lad's freak.
Blackburn and East Lancashire Infirmary.	1892	T. B.	11 ditto	Yes	Accidental	Shot by brother, age 13, who was showing deceased how to fire a small revolver; it missed fire twice and then went off.

(2.)—PROVINCIAL HOSPITALS—*continued.*

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.		Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
LANCASHIRE—*continued.*							
Bolton Infirmary	1891	E. B.	16	Female	No	Accidental	Playing with weapon in a shooting gallery.
Bootle Borough Hospital	1890	P. F.	17	Male	No	ditto	Gunshot? wounds in hands and compound fractures. *
	1892	J. W. (In San Francisco at the time of the injury).	26	ditto	No	Homicidal	Bullet penetrated liver and lungs, and showed in back. (A saloon quarrel.)
	„	C. A.	6	Male	No	Accidental	The patient shot himself in the abdomen, the bullet only penetrating the skin.
Victoria Hospital for Burnley and District.	1891	A. R.	17	ditto	No	ditto	Office boy (17) had loaded revolver in his pocket.
	„	A. B.	16	ditto	No	—	
	„	T. E.	17	ditto	No	Suicidal.	
	1892	T. B.	10	ditto	No	—	Fired at by lad of 17.
	„	G. B.	32	ditto	No	Accidental.	
Bury Dispensary Hospital	1890	A. H.	17	ditto	No	ditto	Amputation of finger; was playing with revolver.
Liverpool Royal Infirmary	1891	J. B.	26	ditto	No	ditto	Although nothing is known of the age of persons using revolvers, it may safely be inferred that they were not children.
	„	J. R.	58	ditto	No	Not known	
	„	S. B.	32	ditto	Yes	Alleged suicide	
	„	G. S.	30	ditto	No	Attempted murder.	
Liverpool, Royal Southern Hospital.	1890	M. C.	23	ditto	No	No record.	
	1891	C. L.	14	ditto	No	Accidental	Inflicted by himself.
	„	A. R.	42	Female	Yes	ditto	Shot by son.
	„	J. H.	26	Male	No	ditto	Done by friend (middle aged).
	1892	V. C.	15	ditto	No	ditto	Inflicted by himself.
	„	?	?5	ditto	Yes	ditto	Inflicted by himself. From recollection, cannot find record.
	„	?	?3	ditto	No	ditto	Shot by brother, aged 5. From recollection, cannot find record.
Manchester and Pendlebury Children's Hospital.	1890	P.	10	ditto	No	ditto	Shot by brother about same age.
	1892	H. N.	16	ditto	No	ditto	Shot in chest by boy about 14 years.
Manchester Royal Infirmary	1890	J. T.	60	ditto	No	No record	No record.
	„	J. H. T.	16	ditto	No	Accidental	Self, by pistol.
	„	E. B.	32	Female	No	ditto	Shot by her husband, who was examining a revolver, thinking it to be unloaded.
	1891	M. A. W.	15	ditto	Yes	—	No record of manner of infliction.
	„	T. R.	29	Male	No	—	ditto - ditto.
	„	F. N.	16	ditto	No	—	ditto - ditto.
	„	J. K.	12	ditto	No	Accidental	By a companion, aged 14.
	„	W. H.	15	ditto	No	ditto	Self, by pistol.
	1892	R. W.	17	ditto	No	ditto	ditto.
	„	A. V.	19	ditto	No	ditto	No record.
	„	T. F.	18	ditto	Yes	ditto	By a companion, aged 18, who forgot his revolver was loaded.
	„	W. F.	17	ditto	No	ditto	Self.
	„	M. H. D.	52	ditto	Yes	Suicidal.	
	„	W. J.	23	ditto	No	Suicidal.	

* It is not certain what kind of fire-arm was used.

(2.)—PROVINCIAL HOSPITALS—*continued.*

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.		Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
LANCASHIRE—*continued.*							
Preston and County of Lancashire Royal Infirmary.	1890	J. G.	19	Male	No	Accidental.	
	1891	A. W.	16	Female	No	ditto.	
	"	B. B.	14	Male	No	ditto.	
	1892	W. C.	14	ditto	No	ditto.	
Salford Royal Hospital	1892	G. B.	14	ditto	No	ditto	Patient had revolver in his pocket, and it went off accidentally, penetrating the abdomen, and wounding the intestine in five places.
LEICESTERSHIRE:							
Leicester Infirmary	1890	L. A.	11	Male	No	Accidental.	
	"	S. B.	13	ditto	No	ditto.	
	1891	H. S.	9	ditto	Yes	ditto	Revolver in the hands of a youth of 12. Two brothers playing with the revolver, both were found fatally injured and unconscious.
	1892	A. M.	12	ditto	No	ditto	Self-inflicted.
	"	J. H.	25	ditto	No	ditto	ditto.
	"	G. H.	15	ditto	No	ditto	Revolver in the hands of another youth.
	"	H. S.	15	ditto	No	ditto	Revolver in hands of youth of 17.
LINCOLNSHIRE:							
Lincoln County Hospital	1890	S. C.	13	Male	No	Accidental	Pistol-shot wound.
	1891	A. S.	22	ditto	No	Suicidal	Murder and attempted suicide.
Grimsby and District Hospital.	1890	—	—	ditto	No	Accidental	Adult.
	1891	J. H.	17	ditto	No	ditto.	
	1892	C. K.	8	ditto	No	ditto	About 12 years of age.
MONMOUTH:							
Newport and Monmouth Hospital.	1890	No records preserved.					
	1891						
	1892	A. M.	19	Male	No	Accidental	Injury to hand.
	"	W. G. W.	15	ditto	Yes	ditto	Wound in shoulder.
NORFOLK:							
Norfolk and Norwich Hospital.	1891	W. C.	16	Male	No	Accidental.	
NORTHUMBERLAND:							
Newcastle Royal Infirmary	1891	F. H.	21	Male	No	Otherwise.	
NOTTINGHAMSHIRE:							
Nottingham General Dispensary.	1891	A. B.	16	Male	No	Accidental	Shot by boy, aged 14.
SOMERSETSHIRE:							
Bridgwater Infirmary	1892	H. P. J.	35	Male	No	Suicidal	Norwegian or Danish sailor.
STAFFORDSHIRE:							
North Staffs Infirmary	1890	J. B.	—	Male	No	Attempted murder.	
	"	J. L.	25	Female	No	ditto.	
Walsall Hospital	1892	J. D.	14	Male	No	Accidental	No particulars kept of these cases.
	"	H. H.	12	ditto	No	ditto	

(2.)—Provincial Hospitals—*continued.*

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.		Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
STAFFORDSHIRE—*continued.*							
West Bromwich District Hospital.	1891	W. D.	14	ditto	No	Accidental.	
	1892	J. M.	19	ditto	No	ditto.	
	„	J. J.	17	ditto	No	ditto	Self-inflicted.
	„	W. D.	16	ditto	No	ditto	ditto.
Wolverhampton and Staffs General Hospital.	1891	—	25	ditto	Yes	Suicidal.	
	„	—	15	ditto	No	Accidental	Small pistol.
Wolverhampton Eye Infirmary.	1892	W. P.	14	ditto	No	ditto	Pistol loaded with powder only. Boy looking down barrel when the pistol went off, severely damaging one eye.
SURREY :							
Croydon General Hospital	1892	G. S.	17	Male	No	Accidental	Bullet removed from hand. It is not certain that this was caused by a revolver.
Guildford, Royal Surrey County Hospital.	1892	J. E.	7	ditto	No	Accidental	Brother, aged 11, pointed it at J. E., not knowing it to be loaded.
SUSSEX :							
Brighton, Sussex County Hospital.	1892	W. J.	53	Male	No	Suicidal.	
	„	B. H.	26	ditto	No	ditto.	
	„	W. B.	23	ditto	No	Accidental.	
Hastings, St. Leonards, and East Sussex Hospital.	1890	F. R.	—	ditto	Yes	Suicidal.	
WARWICKSHIRE :							
Birmingham, Queen's Hospital.	1890	K. D.	9	Female	No	Accidental.	
	„	C. M.	22	Male	No	ditto.	
	1891	A. A.	8	ditto	No	ditto.	
	„	W. H.	34	ditto	Yes	Suicidal.	
	1892	M. McC.	24	ditto	No	Accidental.	
	„	F. G.	22	ditto	No	In self-defence	Assize Court proceedings taken.
	„	E. C.	56	ditto	No	ditto	Assize Court proceedings taken.
	„	A. K.	16	ditto	Yes	Accidental.	
	„	D. B.	18	ditto	Yes	ditto.	
Warmford, Leamington, and South Warwickshire Hospital.	1891	A. F.	11	ditto	No	ditto.	
	„	E. C.	20	ditto	No	ditto.	
	„	H. N.	25	ditto	No	ditto.	
YORKSHIRE :							
Barnsley, Beckett Hospital and Dispensary.	1890	E. G.	14	Male	Yes	Accidental	Playing with lad about 16 years who had revolver in his hand.
Dewsbury and District General Infirmary.	1892	J. M.	18	ditto	No	ditto	Several young fellows playing with weapon.
Halifax Infirmary	1891	J. P.	17	ditto	No	ditto	Inflicted by lad about same age.
	„	J. S.	16	ditto	No	ditto	Self-inflicted.
	1892	W. S.	28	ditto	No	ditto	
Huddersfield Infirmary	„	C. G.	22	Female	No	Homicidal.	Revolver or gun? Self-inflicted.
	„	A. B.	27	Male	No	ditto	About 25 years; insane.
	„	J. W. K.	16	ditto	No	Accidental	Self-inflicted.

(2).—PROVINCIAL HOSPITALS—*continued.*

NAME OF HOSPITAL.	Year.	Initials of Patient.	Age and Sex.		Was the Injury Fatal?	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
YORKSHIRE—*continued.*							
Hull, Royal Infirmary -	1892	A. A. -	40	Male -	Yes -	Suicidal.	
Leeds, General Infirmary -	1890	E. T. -	52	ditto -	No -	Accidental.	
	„	J. F. R. -	48	ditto -	No -	Shot by son during quarrel.	
	„	H. W. P.	24	ditto -	No -	Accidental.	
	„	H. L. -	27	ditto -	No -	- ditto - -	At Fair.
	„	E. S. -	18	Female -	Yes -	- ditto - -	By boy 18 years.
	„	W. H. S.	29	Male -	Yes -	Suicidal.	
	1891	W. H. -	5	ditto -	No -	Accidental -	This child was playing in the street.
	„	J. H. P. -	18	ditto -	No -	- ditto.	
	1892	J. D. -	30	ditto -	No -	- ditto.	
	„	T. D. -	20	ditto -	No -	- ditto - -	By friend whilst out shooting.
	„	A. L. -	25	ditto -	No -	- ditto.	
	„	J. H. -	39	ditto -	No -	E. B. shot J. H.	
	„	E. B. -	28	ditto -	Yes -	Suicidal.	
	„	B. W. -	15	ditto -	Yes -	Accidental -	By boy 14 years.
	„	A. B. -	22	ditto -	No -	- ditto.	
Sheffield General Infirmary	1890	C. H. -	18	ditto -	No -	Accidental.	
	„	J. F. W. -	16	ditto -	No -	- ditto.	
	1891	E. H. -	14	ditto -	No -	- ditto.	
Sheffield Public Hospital -	1892	G. S. -	22	ditto -	Yes -	Suicidal.	
Wakefield Clayton Hospital	„	—	-	—	—	—	One case in 1892, boy, aged seven (accidental) was treated as out-patient.

SUMMARY of HOSPITAL RETURNS.

YEAR.	FATAL INJURIES.					INJURIES not FATAL.				
	Accidental.	Suicidal.	Homicidal.	Otherwise or not known.	TOTAL.	Accidental.	Suicidal.	Homicidal.	Otherwise or not known.	TOTAL.
1890 - - -	3	6	1	-	10	41	5	6	7	59
1891 - - -	7	12	1	2	22	50	10	3	9	72
1892 - - -	9	17	1	-	27	59	14	11	11	95
TOTAL - -	19	35	3	2	59	150	29	20	27	226

RETURN of the Number of INQUESTS held during the Years 1890, 1891, and 1892, on the Bodies of Persons who have Died in consequence of Wounds inflicted by Pistols or Revolvers.

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
BEDFORD	1890	G. H. C.	26	Male	Suicidal.	
BERKSHIRE:						
Newbury District	1892	G. E. S.	21	Female	Murdered	Engaged persons; man first shot the woman and then shot himself.
	"	G. W. W.	24	Male	Suicide	
Eastern District	1890	H. R. H.	34	ditto	ditto.	
Reading Borough	1891	E. L. R.	43	ditto	ditto.	
Wantage District	1891	J. S.	63	ditto	Accidental	Deceased shot himself in the head with a pistol which he was in the habit of using for scaring birds. The body was found on an upturned wheelbarrow, the right elbow resting upon the wheel. The pistol was supposed to have been loaded with a pebble.
BUCKS:						
Beaconsfield District	1890	F. D. L.	44	Male	Suicide.	
	1891	F. E. F.	27	ditto	ditto.	
Winslow or Northern Division.	1892	H. P.	52	ditto	ditto.	
CAMBRIDGESHIRE:						
Cambridge Borough	1891	A. E. E.	21	Male	Suicide.	
Isle of Ely (Southern District).	1892	Unknown	40	ditto	ditto.	
CHESHIRE:						
Knutsford District	1892	F. S. N.	25	Male	Suicide.	
	"	W. P.	42	ditto	ditto.	
	"	J. H.	69	ditto	ditto.	
CORNWALL:						
Western District	1891	A. H.	33	Male	Accidental	Deceased was watching some coast-guard men practising with their revolvers, and improperly took up one which was lying on the ground, when it went off and killed him.
CUMBERLAND:						
Eastern District	1891	J. D.	57	Male	Suicidal.	
DERBYSHIRE:						
Scarsdale Hundred	1892	G. A.	80	Male	Accidental	Deceased was old and feeble, and in examining the revolver whilst loaded it is supposed he pressed the trigger by inadvertence and exploded a cartridge.
Tutbury Honor	1891	M. M.	74	Female	Murder	Firearm unknown; person using also unknown.
	"	W. B.	32	Male	Suicide.	
Borough of Derby	1892	J. S.	14	ditto	Accidental	Deceased supposed to have been shooting sparrows with toy pistol, when a bullet entered his right temple, causing inflammation of brain, from which he died.
DEVONSHIRE:						
Stoke Damerel District	1892	G. H. D.	17	Female	Murder	Six-chambered revolver, used by a lad aged 18.
	"	W. F. K.	21	Male	ditto	
Totnes District	1890	T. S. S.	47	ditto	Suicidal.	
Devonport Borough	1890	K. B. M.	28	ditto	ditto.	
	1892	J. N. N.	29	ditto	ditto.	
	"	J. G. A.	53	ditto	ditto.	
	"	T. H. G.	72	ditto	ditto.	
	"	Person unknown.	70	ditto	ditto.	
Plymouth Borough	1891	A. C.	40	ditto	ditto.	
Honiton District	1892	R. B.	62	ditto	ditto.	
City of Exeter	1891	S. T. G.	46	ditto	ditto.	

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
DORSETSHIRE:						
Dorchester District	1891	W. W. L.	9	Male	Accidental	Explosion of a revolver which belonged to a boy on H.M.S. "Northampton," aged about 14.
	1892	E. W.	19	ditto	Suicide	During temporary insanity.
	"	H. C.	19	ditto	ditto	
DURHAM:						
Chester Ward	1890	R. H.	38	Male	Suicidal.	
	1891	W. D. J.	14	ditto	Accidental	Shot himself playing with revolver.
	1892	H. J. R.	31	ditto	Suicide.	
Easington Ward	1891	E. P.	37	Male	Suicidal.	
	"	M. A.	47	Female	Murder	Shot on highway by man 60 years of age.
Stockton Ward	1890	R. W. P.	23	Male	Suicidal.	
	1891	M. G.	24	ditto	ditto.	
	1892	W. K.	21	ditto	ditto.	
ESSEX:						
Eastern Division	1890	T. B. H.	23	Male	Suicide.	
	1891	A. B.	50	ditto	ditto.	
	"	T. W.	39	ditto	ditto.	
	"	C. C. N.	37	ditto	ditto.	
	1892	P. C.	9	ditto	Accidental	Boy was in the habit of playing with revolver, and it had been left loaded on this occasion.
Western Division	1890	J. P.	47	Male	Suicide.	
	"	T. T.	37	ditto	ditto.	
	"	J. C. T.	22	ditto	ditto.	
	1891	C. G. L.	26	ditto	ditto.	
	"	E. A.	63	ditto	ditto.	
	"	C. R.	25	ditto	ditto.	
	1892	G. P.	42	ditto	ditto.	
	"	H. S.	32	ditto	ditto.	
	"	C. B.	47	ditto	ditto.	
	"	F. A. H.	23	ditto	ditto.	
	"	L. A. H.	17	Female	Murder.	
	"	L. G. R.	34	Male	Suicide.	
GLOUCESTERSHIRE:						
Lower Division	1891	W. M.	22	Male	Suicide.	
	"	W. E. W.	32	ditto	ditto.	
	1892	J. E. F.	39	Female	Murder.	
Forest Division	1891	S. C.	19	Male	Accidental	Deceased was cleaning the revolver (probably being unaware that it was loaded) with muzzle towards his stomach.
Bristol City	1890	J. A. A. B.	43	ditto	Suicidal	Temporarily insane.
	1891	A. E. C.	17	ditto	Accidental	He and another youth were playing with revolver, which went off, wounding him in groin, hence his death.
	1892	J. G.	40	ditto	Suicidal	Shot himself with revolver.
	"	H. J. H.	25	ditto	Partly accidental.	Shot by youth 15, with revolver. Committed on charge of manslaughter, acquitted by jury.
Gloucester City	1890	H. P.	22	ditto	Suicide.	

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
HERTFORDSHIRE:						
Hemel Hempsted District	1892	F. F.	30	Male	Suicide.	
Royston District	1890	R. B.	44	ditto	ditto	To escape capture alive by police.
KENT:						
Ashford District	1890	Unknown	30	Male	Suicide.	
	„	G. S. R.	25	ditto	ditto.	
	1891	N. A. B.	47	ditto	ditto.	
	„	G. M.	73	ditto	ditto.	
	„	Unknown	40	ditto	ditto.	
Sittingbourne District	„	M. McD.	27	ditto	ditto	Suffered from religious mania.
	1892	C. S.	41	ditto	ditto.	
	„	Unknown	? 35	ditto	ditto.	
Cranbrook District	1890	G. P.	58	ditto	ditto.	
Greenwich District	1891	H. L. R.	18	ditto	Accidental	Deceased bought revolver for 5*s.* 6*d.* same morning to shoot his dog (which he did) and threatened to shoot himself.
	1892	Unknown	35	ditto	Suicide.	
	„	M. G. W.	40	Female	ditto.	
Tonbridge District	1890	C. T.	51	Male	ditto.	
	„	H. A. N.	21	ditto	ditto.	
	1891	T. H.	24	ditto	ditto.	
Deal District	„	G. M.	70	ditto	Suicidal	Solicitor in difficulties.
Canterbury City	1890	S. E.	70	ditto	ditto	Purchased revolver, using deception.
	1891	C. F. S.	37	ditto	ditto	Purchased revolver to shoot wood-pigeons, using deception.
	1892	J. B.	74	ditto	Accidental	Barrels fell from stock; one barrel went off, lodging charge in ankle.
Dover Borough and Liberties	1890	A. M.	55	ditto	Suicide	Revolver.
	1891	C. B. C.	50	ditto	ditto	
	1892	C. E.	31	ditto	ditto	
Folkestone Borough	1891	T. W. B.	22	ditto	Accidental	Was examining loaded pistol when it accidentally went off; bullet lodged in brain.
Maidstone Borough	1892	G. T. P.	57	ditto	Suicidal.	
	„	T. C.	65	ditto	ditto.	
Rochester City	„	W. T. C.	37	ditto	ditto.	
LANCASHIRE:						
Salford District	1890	A. G.	34	Male	Suicidal.	
	„	Unknown	? 30	ditto	ditto.	
	1891	S. T. B.	45	ditto	ditto.	
West Derby District	1890	J. P.	60	ditto	Suicide.	
	„	T. E.	29	ditto	Supposed accident.	Shot with pistol by fellow-workman, aged 25.
	„	H. G. F.	34	ditto	Murder	Shot by man on high road with revolver.
	„	G. C.	23	ditto	Accidental	Shot with revolver by friend, aged about 35.
	„	T. McD.	9	ditto	ditto	Killed by shot fired by a man down shooting gallery.

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
LANCASHIRE—*continued.*						
West Derby District—*contd.*	1891	L. T. C.	25	Male	Suicide	Pistol.
	„	J. D. H.	17	ditto	- ditto	- ditto.
	„	R. C.	45	ditto	- ditto	- ditto.
	„	E. J.	43	ditto	Accidental	Shot by man, aged about 40, with revolver.
	1892	T. B. L.	35	ditto	Suicide	Revolver.
	„	J. K.	34	ditto	Not known	Shot with revolver by two boys unknown.
	„	P. E.	64	ditto	Suicide	Revolver.
	„	W. J.	55	ditto	- ditto	- ditto.
Bolton District	1891	T. O. O.	48	ditto	- ditto	Temporarily insane.
	„	T. S.	63	ditto	Murder.	
	„	P. H.	52	ditto	Suicide.	
	1892	A. H. W.	24	ditto	- ditto	Temporarily insane.
Furness, Liberty of	1891	H. N.	35	ditto	Suicidal.	
Hale, Manor of	1890	Unknown	45	ditto	Suicide	Found much decomposed in field; head much damaged; revolver in right hand; two chambers discharged.
Blackburn County Borough	1892	T. B.	11	ditto	Accidental	Deceased, who was in bed, was being shown a toy pistol by brother (13), when latter, not knowing it was loaded, pulled trigger, and shot deceased in forehead. Pistol had been taken from the pocket of an elder brother.
Liverpool City	1890	C. H. B.	29	ditto	Suicide.	
	„	M. S.	23	Female	Murder.	
	1891	E. O. N.	37	Male	Suicide.	
	„	A. W.	43	ditto	- ditto.	
	„	C. A.	47	ditto	- ditto.	
	„	A. R.	52	Female	Accidental	Shot with revolver by her son.
	„	G. B. T.	37	Male	Suicide.	
	„	— B.	32	ditto	- ditto.	
	1892	W. L. H.	36	ditto	- ditto.	
	„	E. B. R.	58	ditto	- ditto.	
	„	H. J.	40	ditto	- ditto.	
	„	H. T.	28	ditto	- ditto.	
	„	E. C.	4	ditto	Accidental	Accidental explosion of a revolver with which he was playing.
	„	R. O.	35	ditto	Suicide.	
Manchester City	1890	J. T.	19	ditto	- ditto	Pistol.
	„	M. R.	71	ditto	- ditto	Revolver.
	„	J. C.	27	ditto	- ditto	- ditto.
	1891	M. A. B. W.	15	Female	Accident	Domestic servant. Revolver pointed by a boy age 10 in play. Revolver the property of boy's father, and not known to be loaded.
	„	W. K.	45	Male	Suicide	Revolver.
	„	T. B. S.	32	ditto	- ditto	Pistol.
	„	P. G. L.	60	ditto	- ditto	Revolver.
	„	T. F.	18	ditto	Accident	Another youth, about 18 years old, was showing the revolver, pulled the trigger, forgetting it was loaded.
	„	M. H. D.	45	ditto	Suicide	Revolver.
Oldham County Borough	„	J. W. M.	38	ditto	Suicidal	Found in railway carriage with revolver by him; business man in reduced circumstances.
Salford County Borough	1890	S. C.	59	ditto	- ditto.	
	1891	R. S. B.	16	ditto	Misadventure	The pistol belonged to and was discharged by youth about same age as deceased.
	1892	J. T.	32	ditto	Suicidal.	
	„	T. C.	59	ditto	- ditto.	

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
LEICESTERSHIRE:						
Loughborough District -	1890	Unknown -	60	Male -	Suicidal - -	A tramp who shot himself with a toy cannon converted into a kind of pistol.
Leicester Borough - -	1891	A. S. -	19	ditto -	- ditto - -	Following on fits of depression.
	„	C. J. S. -	13	ditto -	Accidental	Case of two brothers (schoolboys) playing together in bed with a revolver which had been obtained by barter from a schoolfellow.
	„	F. R. S. -	9	ditto -	- ditto -	
	1892	F. C. -	18	ditto -	Suicidal - -	Revolver purchased at a pawnbroker's. Deceased was in possession of a quantity of literature of the "Dick Turpin" order.
LINCOLN:						
Boston District - - -	1890	A. K. -	20	Male -	Accidental -	Cleaning a pistol not known to be loaded.
	„	W. A. -	60	ditto -	Suicide.	
Lincoln City - - -	„	E. C. -	40	ditto -	- ditto.	
	1891	C. M. -	20	ditto -	- ditto.	
	1892	M. A. G. -	32	Female -	Murder - -	The facility with which the revolver could be purchased, and its cheapness, doubtless contributed to the crime in an essential degree.
LONDON:						
Central Division - - -	1890	W. P. -	36	Male -	Suicide - -	Unsound mind.
	„	F. V. -	25	Female -	Murder - -	Murderer, 29 years.
	„	F. P. S. -	31	Male -	Suicide - -	Unsound mind.
	„	F. D. G. -	41	ditto -	Murder - -	Murderer, 51 years.
	„	H. H. -	52	ditto -	Suicide - -	Unsound mind.
	„	H. L. B. -	24	ditto -	- ditto - -	- - ditto.
	„	W. W. -	36	ditto -	- ditto - -	- - ditto.
	„	O. L. -	25	ditto -	- ditto - -	- - ditto.
	„	S. S. -	22	ditto -	- ditto - -	- - ditto.
	„	A. L. -	29	ditto -	- ditto - -	- - ditto.
	„	J. K. C. -	57	ditto -	- ditto - -	- - ditto.
	„	W. H. -	50	ditto -	- ditto - -	- - ditto.
	1891	C. A. -	49	ditto -	- ditto - -	- - ditto.
	„	J. L. R. -	45	ditto -	- ditto - -	- - ditto.
	„	M. G. -	34	Female -	- ditto - -	- - ditto.
	„	W. F. B. -	27	Male -	- ditto - -	- - ditto.
	„	F. A. F. -	38	ditto -	- ditto - -	- - ditto.
	„	J. R. D. -	18	ditto -	- ditto - -	- - ditto.
	„	F. A. C. -	48	ditto -	- ditto - -	- - ditto.
	„	R. M. -	49	ditto -	- ditto - -	- - ditto.
	„	H. D. -	50	ditto -	- ditto - -	- - ditto.
	„	D. D. -	45	ditto -	- ditto - -	- - ditto.
	„	G. P. -	45	ditto -	- ditto - -	- - ditto.
	„	A. P. S. -	27	ditto -	- ditto - -	- - ditto.
	„	M. A. W. -	29	Female -	Murder - -	Murderer, 33 years.
	„	D. W. -	33	Male -	Suicide - -	Unsound mind.
	„	T. A. J. -	38	ditto -	- ditto - -	- - ditto.
	„	F. W. B. -	27	ditto -	- ditto - -	- - ditto.
	1892	R. D. P. -	43	ditto -	- ditto - -	- - ditto.
	„	J. M. F. -	50	ditto -	- ditto - -	- - ditto.
	„	L. F. -	60	ditto -	- ditto - -	- - ditto.
	„	G. P. -	29	ditto -	- ditto - -	- - ditto.
	„	W. O. -	19	ditto -	- ditto - -	- - ditto.
	„	Unknown -	70	ditto -	- ditto - -	State of mind unknown.
	„	S. E. L. -	21	ditto -	- ditto - -	Unsound mind.
	„	Unknown -	28	ditto -	- ditto - -	State of mind unknown.
	„	W. S. -	77	ditto -	- ditto - -	Unsound mind.
	„	W. T. E. -	30	ditto -	- ditto - -	- - ditto.

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
LONDON—*continued.*						
Central Division—*continued.*	1892	T. G.	32	Male	Suicide	Unsound mind.
	"	Unknown	50	ditto	ditto	State of mind unknown.
	"	G. C.	51	ditto	ditto	Unsound mind.
	"	K. H.	28	ditto	ditto	ditto.
	"	J. C. B. G.	26	ditto	ditto	ditto.
	"	W. E. A.	31	ditto	ditto	ditto.
	"	M. A.	31	Female	ditto	ditto.
	"	F. S. T.	18	Male	ditto	ditto.
	"	E. C. S.	44	ditto	ditto	ditto.
Western Division	1892	G. S.	23	ditto	ditto	Present coroner appointed October 1892.
	"	J. H. C.	33	ditto	ditto.	
	"	D. R.	25	ditto	Unknown.	
North Eastern Division	1890	J. W.	12	Female	Manslaughter.	
	"	C. K.	43	Male	Suicide.	
	"	W. W.	38	ditto	Murder.	
	"	W. L.	45	ditto	ditto.	
	"	A. C.	26	ditto	Suicide.	
	"	A. Q.	43	ditto	ditto.	
	"	J. E.	21	ditto	ditto.	
	1891	A. B.	34	ditto	ditto.	
	"	H. G.	22	ditto	ditto.	
	"	E. U.	40	ditto	ditto.	
	"	C. N.	57	ditto	ditto.	
	1892	R. P.	37	ditto	ditto.	
	"	G. H.	25	ditto	ditto.	
	"	C. B.	33	ditto	ditto.	
	"	A. A.	29	ditto	ditto.	
	"	A. R.	28	ditto	ditto.	
	"	G. H.	28	ditto	ditto.	
	"	W. W.	54	ditto	ditto.	
	"	W. G.	44	ditto	ditto.	
Eastern Division	1890	F. M.	47	ditto	Suicidal.	
	"	J. R.	28	ditto	ditto.	
	1891	F. B.	56	ditto	ditto.	
	"	E. F.	50	ditto	ditto.	
	"	C. T.	61	ditto	ditto.	
	1892	W. E. H.	47	ditto	ditto.	
	"	J. T.	19	ditto	ditto.	
	"	W. J. G.	36	ditto	ditto.	
London City	1890	E. W. M.	52	ditto	ditto	Temporary insanity.
	"	E. E.	38	ditto	ditto	ditto.
	"	W. P.	47	ditto	ditto	ditto.
	1891	W. R. W.	35	ditto	ditto	ditto.
	"	G. P.	41	ditto	ditto	ditto.
	"	J. T.	61	ditto	ditto	ditto.
	"	S. S. B.	20	ditto	ditto	ditto.
	"	D. P.	28	ditto.		
	"	J. M.	49	ditto	Suicidal	Temporary insanity.
	1892	H. J. C.	25	ditto	ditto	ditto.
	"	E. L. J.	22	ditto	ditto	ditto.
	"	G. C.	43	ditto	ditto	ditto.
	"	L. M. K.	69	ditto	ditto	ditto.
	"	J. M. E. C.	44	ditto	ditto	ditto.
	"	S. E.	27	ditto	ditto	ditto.

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
LONDON—*continued.*						
Southwark Borough - - -	1890	M. N. N. -	26	Male -	Suicidal - -	Temporary insanity.
	1891	T. M. -	56	ditto -	- ditto - -	- - ditto.
	„	C. W. G. -	52	ditto -	- ditto - -	- - ditto.
	1892	R. R. S. -	25	ditto -	- ditto - -	- - ditto.
	„	J. W. -	25	ditto -	- ditto - -	- ditto.
Duchy of Lancaster District	1891	F. C. -	31	ditto -	- ditto - -	- - ditto.
Westminster City and Liberty	1890	F. O. -	29	ditto -	Suicide - -	Pistol-shot wound in face.
	„	F. W. L. -	30	ditto -	- ditto - -	Pistol-shot wound in head.
	„	J. D. V. -	60	ditto -	- ditto - -	Pistol-shot wound in mouth.
	„	R. C. -	44	ditto -	- ditto - -	- - ditto - ditto.
	„	A. de G. -	20	ditto -	- ditto - -	Pistol-shot wound in head.
	„	R. H. H. -	17	ditto -	- ditto - -	Revolver-shot in left breast.
	„	H. de O. C.	26	ditto -	Not known -	Self-inflicted wound over heart.
	„	E. E. L. -	59	ditto -	Suicide - -	Revolver wound in head.
	„	E. G. -	24	ditto -	- ditto - -	- - ditto - ditto.
	„	G. D. -	21	ditto -	- ditto - -	- - ditto - ditto.
	„	G. A. M. -	23	ditto -	- ditto - -	Pistol wound in head.
	„	W. H. B. -	56	ditto -	- ditto - -	- - ditto.
	„	L. H. -	54	ditto -	- ditto - -	- - ditto.
	1891	E. R. -	24	ditto -	- ditto - -	- - ditto.
	„	F. C. H. -	72	ditto -	- ditto - -	Pistol wound in heart.
	„	T. C. -	81	ditto -	- ditto - -	Pistol-shot wound in head.
	„	R. L. A. -	33	ditto -	Accidental -	Self-inflicted wound in head.
	„	R. R. -	31	ditto -	Suicide - -	Pistol-shot wound in chest.
	„	M. M. S. -	17	ditto -	- ditto - -	Pistol-shot wound in head.
	„	H. C. P. -	40	ditto -	- ditto - -	Pistol-shot wound in heart.
	„	R. W. -	38	ditto -	- ditto - -	Pistol-shot wound in head.
	„	G. H. W. -	40	ditto -	- ditto - -	- - ditto - ditto.
	„	A. A. -	23	ditto -	- ditto - -	- - ditto - ditto.
	„	J. C. - -	68	ditto -	- ditto - -	Pistol-shot wound in mouth.
	„	R. M. -	46	ditto -	- ditto - -	Pistol-shot wound in left shoulder.
	„	J. W. G. -	27	ditto -	- ditto - -	Pistol-shot wound in temple.
	1892	J. C. - -	57	ditto -	- ditto - -	Pistol-shot wound in mouth.
	„	F. S. V. Z.	35	ditto -	- ditto - -	Pistol-shot wound in head.
	„	H. S. Y. -	32	ditto -	- ditto - -	Pistol-shot wound in forehead.
	„	M. S. -	40	ditto -	- ditto - -	Pistol-shot wound in head.
	„	E. T. C. -	68	ditto -	- ditto - -	- - ditto - ditto.
	„	A. C. W. -	44	ditto -	- ditto - -	- - ditto - ditto.
	„	J. C. - -	39	ditto -	- ditto - -	- - ditto - ditto.
	„	J. J. - -	42	ditto -	Murder.	
	„	R. S. J. -	38	ditto -	Suicide - -	Pistol-shot wound in head.
	„	G. C. - -	24	ditto -	- ditto - -	Pistol-shot wound in heart.
	„	C. C. -	19	ditto -	- ditto - -	Pistol-shot wound in head.
	„	H. P. -	82	ditto -	- ditto - -	- - ditto - ditto.
	„	C. G. E. -	26	ditto -	- ditto - -	- - ditto - ditto.
	„	L. C. A. -	67	ditto -	- ditto - -	- - ditto - ditto.
	„	G. W. S. -	23	ditto -	- ditto - -	Pistol-shot wound in left side.
	„	G. J. L. -	48	ditto -	- ditto - -	Pistol-shot wound in head.
	„	A. E. P. -	37	ditto -	- ditto - -	- - ditto - ditto.

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.	Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
LONDON—*continued.*					
South Eastern District -	1890	T. W. -	43 Male -	Suicide.	
	,,	G. W. B. -	26 ditto -	- ditto.	
	1891	W. M. -	75 ditto -	- ditto.	
	,,	G. H. P. -	22 ditto -	- ditto.	
	,,	E. P. -	41 Female -	- ditto - -	Attempted suicide, similar way, five years before.
	1892	J. S. H. -	70 Male -	- ditto.	
	,,	J. B. - -	19 ditto -	- ditto - -	Accidentally injured head with revolver two years before.
	,,	A. L. D. -	54 ditto -	- ditto.	
	,,	A. F. V. -	31 ditto -	- ditto.	
	,,	H. W. H. -	34 ditto -	- ditto.	
	,,	R. T. M. -	28 ditto -	- ditto.	
	,,	W. W. -	43 ditto -	- ditto.	
Newington District - -	1890	T. H. -	65 Female -	Murder.	
	,,	H. E. W. -	30 Male -	Suicide.	
	,,	E. S. -	27 ditto -	- ditto - -	With revolver in gun shop where he had enquired how to load it.
	,,	C. J. G. -	19 ditto -	Suicide - -	Toy pistol.
	1891	J. A. -	50 ditto -	- ditto.	
	,,	J. H. -	28 ditto -	Murder.	
	1892	T. S. -	62 ditto -	Suicide.	
	,,	W. K. -	22 ditto -	- ditto.	
	,,	C. B. M. -	37 ditto -	- ditto.	
	,,	R. L. -	20 ditto -	- ditto.	
	,,	M. B. L. -	21 Female -	Murder.	
	,,	E. O. -	19 ditto -	- ditto.	
	,,	C. P. -	40 Male -	Suicide.	
	,,	H. R. -	42 ditto -	- ditto.	
Camberwell (now Southern District).	1890	C. G. -	24 ditto -	Accident - -	The accident happened with an old double-barrel pistol bought at a sale by husband of woman who fired it. When handled it was considered to be unloaded.
	1891	A. W. -	32 ditto -	Suicide - -	Deceased had been in South Africa and was known to have revolver. Was discovered shot on canal bank, but no revolver could be found.
	1892	E. J. -	20 Female -	- ditto - -	Deceased was a servant and obtained possession of master's revolver from a drawer where it had been for years.
South Western and Kingston District.	1890	P. N. -	44 Male -	- ditto.	
	,,	R. H. -	36 Female -	Murder - -	Shot with revolver by husband.
	1891	F. C. -	22 Male -	Suicide - -	Pistol was bought by his younger brother, aged 16, at a pawnbrokers.
	,,	C. L. -	55 ditto -	- ditto.	
	,,	H. D. F. -	48 ditto -	- ditto - -	Shot himself with new six-chambered revolver.
	,,	W. J. W. -	38 ditto -	- ditto - -	Had revolver some time.
	,,	A. R. H. -	32 ditto -	- ditto - -	Five-chambered revolver. Had it some time.
	1892	Unknown -	65 ditto -	- ditto.	
	,,	N. M. D. -	31 ditto -	- ditto - -	Bought revolver and cartridges at Army and Navy Stores a few days previously.

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
MIDDLESEX:						
Central District	1890	G. J. C.	33	Male	Suicide	Unsound mind.
	1891	F. M. L. F.	58	ditto	ditto	ditto.
	1892	J. E. H.	46	ditto	ditto	ditto.
Western District	„	T. D. H. A.	56	ditto	Suicide	Unsound mind.
	„	J. B.	56	ditto	ditto	ditto.
Eastern District	1890	H. B.	21	ditto	ditto	
	1891	F. S.	21	ditto	ditto	
	„	R. S.	19	Female	ditto	
	„	Unknown	25	Male	ditto	
	1892	ditto	50	ditto	ditto	
	„	S. Q.	71	ditto	ditto	
	„	A. F.	21	ditto	ditto	
MONMOUTHSHIRE:						
Abergavenny District	1892	S. D.	24	Male	Suicidal.	
Southern District	„	—	35	ditto	ditto	Shot himself with revolver in a railway carriage.
NORFOLK:						
Norwich District	1890	R. S.	61	Male	Suicidal.	
	„	E. R. C.	39	ditto	ditto	Impossible to say whether death resulted from gunshot or pistol wound.
Duke of Norfolk's Liberty	1891	I. T.	43	ditto	ditto	Suffering from brain disease.
King's Lynn Borough	„	J. S.	34	ditto	—	Inflicted by himself; not sufficient evidence to show whether by accident or intention.
Norwich City	„	J. R.	27	ditto	Suicide.	
NORTHAMPTONSHIRE:						
Eastern Division	1892	D. B.	40	Male	Suicidal.	
NORTHUMBERLAND:						
Southern District	1891	M. Y.	53	Male	Suicide	Revolver.
	1892	J. M. H.	25	ditto	ditto	ditto.
	„	W. M.	53	ditto	ditto	ditto.
	„	Unknown	–	ditto	ditto	ditto.
Newcastle-on-Tyne City	1890	M. A. C.	23	ditto	Suicidal.	
	„	G. E. C. H.	17	ditto	ditto	
	„	J. S.	31	ditto	ditto	
	1892	A. R. R.	23	ditto	ditto	
NOTTINGHAMSHIRE:						
Nottingham District	1892	M. D.	27	Male	Suicide	Examining an old gun.
Newark District	1891	J. R. P. P.	19	ditto	ditto	Revolver.
Retford District	1890	J. B.	66	ditto	Suicidal	(Supposed).

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
NOTTINGHAMSHIRE—*continued.*						
Nottingham Borough	1890	E. B.	22	Female	Suicide.	
	„	T. R.	57	Male	ditto.	
	1891	M. N.	61	ditto	ditto.	
	1892	H. J. W.	24	ditto	ditto.	
	„	L. B.	23	ditto	ditto.	
OXFORDSHIRE:						
Central District	1892	E. T. G.	5	Male	Accidental	Deceased was playing with pistol which exploded.
Northern District	1890	J. M.	41	ditto	Suicidal	By use of revolver kept in private dwelling-house.
University Liberty	1891	C. L. S.	21	ditto	ditto	Death was due to a pistol wound; there was not sufficient evidence to show state of mind.
Oxford City	1892	G. E. M.	14	ditto	ditto	School boy travelling by himself on railway to Oxford to be entered at a new school. The weapon was a toy pistol.
SOMERSETSHIRE:						
Western District	1891	R. W.	38	Male	Suicidal	Revolver.
	1892	J. W.	45	ditto	—	Deceased was frequently intoxicated.
Bath City and County Borough.	„	H. N.	58	ditto	ditto	Deceased a sea pilot, and the suicide was deliberate.
SOUTHAMPTON:						
Fareham District	1890	F. E. B.	52	Male	Suicidal	
	„	F. C. H.	38	ditto	Accidental	
	1892	R. P.	57	ditto	Suicidal	
Southampton District	1891	C. B. P.	49	ditto	ditto	Pistol; unsound mind.
	„	H. S.	42	ditto	ditto	Revolver; unsound mind.
	„	J. F.	59	ditto	ditto	Revolver.
Winchester District	1890	W. K.	34	ditto	ditto	Revolver; unsound mind.
Ringwood Hundred	„	A. L. S.	54	ditto	ditto	
Portsmouth Borough	„	M'C.	50	ditto	Suicide	
	„	A. J. C.	35	ditto	ditto	
	„	J. H. W.	38	ditto	ditto	
	„	R. T.	40	ditto	ditto	
	„	W. J.	33	ditto	ditto	
	1891	E. E. W.	32	Female	Murder	The Coroner states that juries are constantly calling attention to the easy manner in which revolvers and fire-arms may be purchased.
	„	G. W. T.	22	Male	Accidental	
	„	C. F. D.	22	ditto	Suicide	
	1892	G. E. H.	33	ditto	ditto	
	„	J. K.	44	ditto	ditto	
	„	F. S.	47	ditto	ditto	
	„	A. R.	24	ditto	ditto	
	„	W. S. R.	19	ditto	ditto	
Southampton Borough	„	E. W.	33	ditto	ditto	
	„	T. F.	40	ditto	ditto	
Isle of Wight	„	W. R.	46	ditto	Suicidal	Revolver.

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
STAFFORDSHIRE:						
Hanley District	1890	J. S.	17	Male	Accidental	Boys shooting at a mark, when deceased was shot.
Wolverhampton District	„	M. D.	44	Female	Murder.	
	1891	J. W.	59	Male	Suicide	Temporary insanity.
	„	D. P.	30	ditto	ditto	ditto.
	„	C. H.	26	ditto	ditto	Temporary insanity.
	„	A. Y.	28	ditto	ditto	ditto.
Dudley District	1890	A. L.	42	ditto	ditto.	
Wolverhampton Borough	1891	J. H. W.	47	ditto	ditto	Temporary insanity.
	1892	T. K.	25	ditto	ditto	ditto.
SUFFOLK:						
Bury St. Edmund's Borough	1891	C. I. L.	18	—	Suicide	Temporary insanity. Insanity in the family.
SURREY:						
Reigate District.	1890	A. S. T.	23	Male	Suicidal.	
	1891	W. B. W.	72	ditto	ditto.	
	1892	J. H. W.	52	ditto	ditto.	
	„	A. F. S.	29	ditto	ditto.	
	„	W. B.	23	ditto	ditto.	
	„	F. G. W.	60	ditto	ditto.	
	„	R. S.	36	ditto	ditto.	
	„	J. W. M.	38	ditto	ditto.	
Kingston District	1891	W. J. H. F.	19	ditto	Suicide.	
	„	H. E.	46	ditto	ditto.	
	„	W. S.	31	ditto	ditto.	
	„	C. V. W.	51	ditto	ditto.	
	„	Unknown	50	ditto	ditto.	
	„	W. C.	47	ditto	ditto.	
	„	G. W. W.	43	ditto	ditto.	
	1892	I. L.	66	ditto	ditto.	
	„	I. R.	22	ditto	ditto.	
	„	G. P. L.	32	ditto	ditto	Bought pistol day previous.
Guildford District	1890	G. B.	28	ditto	Suicidal	The coroner states that he has no definite record of the cause of death, but has however been able to identify these cases. Is under the impression that he had one or two cases of accidental death caused by the careless use of revolvers.
	1891	J. H. L.	34	ditto	ditto	
	1892	J. T. W. A.	35	ditto	ditto	
Croydon Borough	1890	F. B.	63	ditto	ditto	Revolver.
	„	H. W. T.	33	ditto	Doubtful	ditto.
	1891	A. V. de P.	41	ditto	Suicidal	Bought revolver for purpose.
	1892	W. N. W.	34	ditto	Accidental	Practising at target.
Guildford Borough	„	G. S.	36	ditto	Suicidal.	

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
SUSSEX:						
Lewes District	1890	J. P.	65	Male	Suicide.	
	"	Unknown	35	ditto	ditto.	
	1891	G. H.	52	ditto	ditto	
	1892	F. I. K.	24	ditto	ditto.	
Western Division	1890	G. W. E. S.	37	ditto	ditto.	
	"	A. H.	60	ditto	ditto.	
Brighton Borough	1890	C. A. L.	22	Male	Suicide	Revolver.
	1891	E. S.	35	ditto	ditto	ditto.
	"	J. W. H.	33	ditto	ditto	ditto.
	"	J. C. S.	25	ditto	ditto	Pistol.
	1892	C. B.	41	ditto	ditto	Revolver.
	"	W. P. B.	23	ditto	ditto	ditto.
	"	F. H.	63	ditto	ditto	Small pistol.
	"	E. E. T.	22	ditto	ditto	Revolver.
Hastings Borough	1890	J. F. R.	22	ditto	Suicidal	ditto.
	"	Unknown	65	ditto	ditto	ditto.
WARWICKSHIRE:						
Northern Division	1890	E. M.	47	Male	Suicide.	
	1892	W. C.	35	ditto	ditto.	
Central Division	1891	J. R. R.	34	ditto	Suicidal	This man first shot his cousin, and then went home and shot himself with same revolver.
	"	G. A. B.	29	ditto	Murder	Shot by the foregoing.
	1892	J. F. G.	74	ditto	ditto	Shot by his son, with revolver.
Birmingham Borough	1891	M. M.	14	Female	ditto	Shot by H. H., aged 17, with a revolver.
	"	W. M.	53	Male	Suicide	Shot himself with revolver.
	"	J. H.	63	ditto	ditto	ditto.
	"	J. C.	47	Female	Accidental	Shot by her son, aged 12, when playing with a pistol.
	1892	S. N. H.	11	Male	Misadventure	Shot by brother, aged 15, when playing with revolver.
	"	G. W. C.	16	ditto	Accidental	Shot by J. J., aged 17, with a revolver.
	"	J. B.	51	ditto	Suicide	Shot himself with pistol.
	"	R. G.	54	Female	Murder	Shot with revolver, by husband.
	"	F. G.	55	Male	Suicide	Shot himself with revolver.
WILTSHIRE:						
Northern District	1891	T. A.	41	Male	Accidental	Two men playing with an old pistol, which was supposed to be empty.
	1892	W. S. E.	28	ditto	Suicide	Pistol. Temporary insanity.
	"	J. A. E.	54	ditto	ditto	ditto.
Mid Division	1892	H. R.	28	ditto	Murder.	
	"	G. M.	49	ditto	ditto.	
	"	A. A.	72	ditto	Suicide.	
WORCESTERSHIRE:						
Northern Division	1891	J. A.	49	Male	Suicide	Revolver. Unsound mind.
	"	W. T. S.	18	ditto	Accidental	Revolver.
Southern Division	1891	H. A. P.	59	ditto	Suicidal.	
Worcester City	1891	T. S.	30	ditto	ditto	Deceased was formerly a warder at Prestwich Lunatic Asylum.
	1892	J. K.	60	ditto	ditto	Had been confined in a lunatic asylum.

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
YORKSHIRE:						
York District	1890	H. C. J.	32	Male	Suicide	Revolver.
	1892	W. W. T.	27	ditto	ditto	A very old-fashioned pistol.
Wakefield and Selby Districts	1890	J. H.	22	ditto	Manslaughter	Shot by J. C. with a revolver, at Wakefield.
	„	J. F.	25	ditto	Suicidal	Shot himself with revolver, of which he had charge as an officer's servant.
Northern District	1890	J. F.	32	ditto	Doubtful	Probably suicidal.
	1892	J. C. A.	9	ditto	Accidental	Person, 11 years of age, using pistol.
East Riding District	1890	M. S.	40	ditto	Suicide	Pistol — The coroner states that in several instances mere children have had possession of the revolver, and that it seems highly desirable that this should so far as possible be prevented.
	„	T. A. N.	57	ditto	Suicide	Revolver
	„	A. S.	15	ditto	Accidental	ditto
	1891	E. T. S.	52	ditto	Suicide	ditto
Langbaurgh, North District	1890	W. C.	27	ditto	ditto.	
	„	J. G. D.	36	ditto	ditto.	
	1892	G. B.	50	ditto	ditto.	
Langbaurgh, East District	1891	L. S.	23	ditto	ditto	Deceased used revolver belonging to his late father.
Halifax District, Honor of Pontefract.	1891	F. W. A.	43	ditto	Suicidal.	
	1892	J. S.	48	ditto	ditto.	
	„	F. L.	64	ditto	ditto.	
	„	G. H. T.	43	ditto	ditto.	
Wakefield District, Honor of Pontefract (Coroner Taylor).	1890	E. G. G.	21	ditto	ditto	Shot himself with revolver in an unused greenhouse at Cleckheaton.
	„	E. G.	14	ditto	Accidental	Shot with revolver by A. O., aged 17 years.
	1891	C. V. A.	3	ditto	ditto	Shot with revolver by B. A., his nurse, who took up the pistol, which was in her master's bedroom.
Wakefield District, Honor of Pontefract (Coroner Maitland).	1890	R. M.	62	ditto	Suicidal	The deceased was found dead, having shot himself with a revolver.
	1891	H. S.	40	ditto	ditto	Revolver.
	1892	D. A.	51	ditto	ditto	Shot himself with pistol.
Bradford Borough	1891	J. W. N.	44	ditto	Suicide	Revolver.
	„	J. B. C.	18	ditto	Accidental	Revolver accidentally discharged.
	1892	H. G.	17	ditto	Suicide	Revolver. Temporary insanity.
	„	W. H. B.	19	ditto	ditto	Pistol-shot. Temporary insanity.
Hull Borough	1890	G. B.	20	ditto	Suicidal	Revolver. No evidence as to state of mind.
	1891	F. O.	45	ditto	ditto	Insane. Revolver
	1892	T. C. G.	58	ditto	ditto	Insane. Pistol.
	„	W. J. C. P.	3	ditto	Accidental	The mother of the child took up loaded revolver and accidentally shot him.
	„	G. A.	46	ditto	Suicidal	Insane. Revolver.

RETURN of the Number of Inquests held during the Years 1890, 1891, and 1892, &c.—*continued.*

NAME OF COUNTY AND OF CORONER'S DISTRICT.	Year.	Initials of Person on whom Inquest held.	Age and Sex.		Whether supposed to be Accidental, Suicidal, or otherwise.	Any Remarks, especially as to the Age of the Person using the Revolver.
YORKSHIRE—*continued.*						
Leeds Borough	1890	E. S.	18	Female	Accidental	Male fellow servant, aged 21, playing with his master's revolver.
	"	W. H. S.	29	Male	Suicide	In possession of pistol, which he used during mental strain from over work.
	1892	E. B.	27	ditto	ditto	Revolver.
	"	B. W.	15	ditto	Accidental	Pistol presented in play by school-fellow (17). Both lads were in possession of firearms.
	"	H. T. W. H.	24	ditto	Found dead	Found in wood with revolver in hand, with one barrel discharged and bullet-wound in temple.
Scarborough Borough	1890	C. C. H.	20	ditto	Suicide.	
	1892	C. C.	18	ditto	ditto	Under the influence of drink at the time.
Sheffield Borough	1891	R. B.	51	ditto	ditto.	
	"	G. S.	36	ditto	ditto.	
	"	W. H. C.	55	ditto	ditto.	
WALES.						
CARNARVON :						
Southern District	1892	A. W. G. P.	20	Male	Suicidal	Hereditary mania.
FLINT :						
Flint County	1892	J. W.	44	Male	Suicidal	Revolver.
GLAMORGAN :						
Eastern District	1890	J. J.	18	Male	Accidental.	
	1891	A. M.	51	ditto	Suicide.	
	"	M. W.	58	ditto	ditto.	
	1892	A. F.	50	ditto	ditto.	
Cardiff Borough	1890	A. R.	35	Female	Murder	Murderer found to be insane.
	1892	C. S.	21	Male	Suicide.	
Swansea Borough	1891	W. M.	52	ditto	Accident	The revolver was not believed to be loaded by W. S., who pulled trigger.
	1892	H. E. M.	34	ditto	Suicide.	
	"	E. J. C.	31	ditto	ditto.	
MERIONETH	1892	T. B. T.	28	Male	Accidental.	
PEMBROKE :						
Upper District	1892	E. O.	14	Male	Accidental	Wound of hand resulting in blood poisoning and tetanus.
Lower District	"	E. A. W.	9	ditto	ditto	The boy who purchased this pistol at an ironmonger's shop was 14½ years of age; and the boy who fired the pistol was 13 years of age.

SUMMARY of Coroners' Returns.

YEAR.	Accidental.	Suicidal.	Homicidal.	Otherwise or not known.	Total.
1890	11	113	11	4	139
1891	22	147	8	3	180
1892	16	183	13	5	217
Total	49	443	32	12	536

RETURN of the Number of Persons Sentenced to Death in each of the Three Years, 1890, 1891, and 1892, for Murder committed by means of Revolvers.

YEAR.	Total Number of Persons Sentenced to Death.	Number of cases in which the Crime was committed with a Revolver.
1890	24	3
1891	19	4
1892	22	3

REVOLVERS (DEATHS AND INJURIES).

RETURNS giving Particulars of Cases treated for REVOLVER or PISTOL WOUNDS in HOSPITALS during the Years 1890, 1891, and 1892; of INQUESTS held during the same Period on the Bodies of Persons Killed by the discharge of Revolvers or Pistols; and, the Number of Persons Sentenced to Death in each of the aforesaid Years for MURDER committed by means of Revolvers.

(*Mr. Herbert Gladstone.*)

Ordered, by The House of Commons, *to be Printed,*
15 *August* 1893.

[*Price* 3 *d.*]

371. *Under* 3 *oz.*

RETURN to an Order of the Honourable The House of Commons, dated 21 June 1893 ;—*for,*

RETURN "showing, by Departments, the Number of CLERKS or Permanent MESSENGERS in the CIVIL SERVICE, or PARK or LODGE KEEPERS under the OFFICE OF WORKS, the OFFICE OF WOODS AND FORESTS, or the BOARD OF GREEN CLOTH, appointed since the 1st day of September 1887, and the Number of such Clerks, Permanent Messengers, Park or Lodge Keepers, who, prior to Appointment, served in the NAVY, ARMY, or ROYAL MARINES, in accordance with the recommendation of the SELECT COMMITTEE appointed in 1877 'to inquire how far it was practicable that SOLDIERS, SAILORS, and MARINES who had meritoriously served their Country should be employed in such Civil Departments of the Public Service as they may be found fitted for' (in continuation of Parliamentary Paper, No. 357, of Session 1891."

Treasury Chambers,
3 August 1893.

JOHN T. HIBBERT.

(*Major Rasch.*)

Ordered, by The House of Commons, *to be Printed,*
3 *August* 1893.

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360.

RETURN showing, by Departments, the Number of CLERKS or Permanent MESSENGERS in the CIVIL SERVICE, or PARK or LODGE KEEPERS under the OFFICE OF WORKS, the OFFICE OF WOODS AND FORESTS, or the BOARD OF GREEN CLOTH, appointed since the 1st day of September 1887, and the Number of such Clerks, Permanent Messengers, Park or Lodge Keepers, who, prior to Appointment, served in the NAVY, ARMY, or ROYAL MARINES, in accordance with the recommendation of the SELECT COMMITTEE appointed in 1877 "to inquire how far it was practicable that SOLDIERS, SAILORS, and MARINES who had meritoriously served their Country should be employed in such Civil Departments of the Public Service as they may be found fitted for" (in continuation of Parliamentary Paper, No. 357, of Session 1891).

I.—MESSENGERS, &c.

DEPARTMENT.	Number of Messengers, &c., appointed.	Number who have served in the Navy, Army, or Royal Marines.
* Admiralty	45	37
* Agriculture, Board of	5	1
* British Museum	30	–
Census Office (Ireland)	4	1
* Chief Secretary's Office (Ireland)	6	3
* Colonial Office	1	–
* Commons, House of	10	2
* Consular and Diplomatic Service	4	2
* Customs	2†	1
Deeds, Registry of (Ireland)	1	1
* Exchequer and Audit Office	3	–
* Exchequer Office (Scotland)	1	–
* Foreign Office	4	1
Home Office	6	–
* India Office	7	1
* Inland Revenue	48	1
* Irish Land Commission	6	2
* Judge Advocate General's Office	1	1
* Land Registry Office	2	1
* Land Revenue Record Office	1	–
* Local Government Board (England)	6	–
* Ditto (Ireland)	1	–
* London University	1	–
* Lords, House of	10	2
* Lunacy Board (Scotland)	1	1
* Lunacy Commission (England)	2	–
* Metropolitan Police Courts	23	1
Metropolitan Police Office	1	–
Military Prisons	1	1
* Mint	12	3
* National Debt Office	1	–
* National Education Office (Ireland)	2	1
National Gallery (England)	12	9
* Paymaster General's Office	3	1
* Post Office	422‡	144
* Prisons Board (Ireland)	1§	–
Carried forward	686	218
Brought forward	686	218
* Prisons (England)	7§	2
* Privy Council Office	1	–
* Public Works Loan Office	1	–
* Public Works Office (Ireland)	1	–
Queen's Colleges (Ireland)	1	1
* Record Office (England)	13	2
* Ditto (Ireland)	1	–
* Register House Departments (Edinburgh).	2	2
* Registrar General's Office (England)	6	–
* Science and Art Department	99	14
* Scotland, Office of Secretary for (London).	4	1
* Sessions Court (Scotland)	1	–
Stationery Office	3	–
* Supervision (Scotland), Board of	1	1
* Supreme Court of Judicature (England).	3	1
* Supreme Court of Judicature (Ireland).	6	1
Temporary Commissions	1	–
* Trade, Board of	5	–
* Trade, Board of (Patent Office)	6	–
* Treasury	4	
* War Office (including Royal Hospital, Chelsea).	14	10
* Works, Office of (including Royal Parks and Gardens).	79	71
TOTAL	945	324

In those Offices marked with a (*) special indulgence is given as regards age to former soldiers and sailors.

Note.—The messengers in the Board of Green Cloth are paid from the Queen's Civil List. They are not comprised with the general term of the Civil Service, and are not provided with Civil Service Certificates.

† Not including Customs Boatmen, who are to some extent drawn from the class of discharged marines and sailors.

‡ Not including Letter Carriers, of whom a considerable and increasing number is annually drawn from the class of discharged soldiers and sailors.

§ Not including Warders in Prisons, of whom a large proportion is drawn from the class of discharged soldiers.

II.—Clerks.

DEPARTMENT.	Number of Clerks, &c., appointed.	Number who have served in the Navy, Army, or Royal Marines.
Accountant in Bankruptcy (Scotland)	1	–
Admiralty	11	10
Broadmoor Criminal Lunatic Asylum	3	–
Census Office (Scotland)	2	–
Ditto (Ireland)	99	–
Charitable Donations and Bequests (Ireland).	1	–
Collector General of Rates, Dublin	4	–
Colonial Office	1	–
Commons, House of	1	–
Consular and Diplomatic Service	3	–
Dundrum Criminal Lunatic Asylum	1	–
Ecclesiastical Commission	4	–
Fishery Board (Scotland)	1	–
oreign Office	9	–
Home Office	3	–
India Office		–
* Irish Land Commission	17	–
Justiciary (Scotland) Court of	1	–
Land Registry	2	–
Local Government Board (England)	6	–
Ditto (Ireland)	1	–
* Lords, House of	1	1
Lunacy Board (Scotland)	1	–
Metropolitan Police Courts	8	–
Metropolitan Police Office	6	–
Mint	9	–
Carried forward	197	11

DEPARTMENT.	Number of Clerks, &c., appointed.	Number who have served in the Navy, Army, or Royal Marines.
Brought forward	197	11
Northern Lighthouses Board	1	–
* Post Office	6,543†	75
Prisons Board (Ireland)	4	1
* Prisons (England)	3	1
Prisons (Scotland)	1	–
Quit Rent Office, Dublin	1	–
Record Office (England)	6	–
Ditto (Ireland)	1	–
Register House Departments (Edinburgh).	1	–
Science and Art Department	1	–
Scotland, Office of Secretary for (London).	1	–
Stationery Office	2	–
Supervision, Board of (Edinburgh)	1	–
Supreme Court of Judicature (England).	57	1
Supreme Court of Judicature (Ireland).	6	–
* Temporary Commissions	40	3
Trade, Board of (including Mercantile Marine Offices).	32	1
Trade, Board of (Patent Office)	1	–
Treasury	12	
War Office	1	–
Woods, Office of	3	–
TOTAL	6,915	93

In those Offices marked with a (*) special indulgence as regards age is given to former soldiers and sailors who are candidates to the clerkships included in this Return.

Clerks appointed after open and limited competition are not included in this Return.

† Consisting chiefly of Sorting Clerks and Telegraph Learners in Provincial Post Offices, who are for the most part young men between 14 and 25 years of age.

J. S. Lockhart,
Civil Service Commission.

1 August 1893.

SOLDIERS AND SAILORS (CIVIL EMPLOYMENT).

RETURN showing, by Departments, the Number of CLERKS or Permanent MESSENGERS in the CIVIL SERVICE, or PARK or LODGE KEEPERS under the OFFICE OF WORKS, the OFFICE OF WOODS AND FORESTS, or the BOARD OF GREEN CLOTH, appointed since 1 September 1887, and the Number of such Clerks, Permanent Messengers, Park or Lodge Keepers, who, prior to Appointment, served in the NAVY, ARMY, or ROYAL MARINES, &c.; (in continuation of Parliamentary Paper, No. 357, of Session 1891).

(*Major Rasch.*)

Ordered, by The House of Commons, *to be Printed,*
3 *August* 1893.

[*Price* $\frac{1}{2}$ *d.*]

360. *Under* 1 *oz.*

ULTIMUS HÆRES (SCOTLAND) (ACCOUNT AND LIST OF ESTATES).

RETURN to an Order of the Honourable The House of Commons, dated 4 July 1893;—*for*,

COPY "of RETURNS of ABSTRACT ACCOUNT of the RECEIPTS and PAYMENTS of the QUEEN'S and LORD TREASURER'S REMEMBRANCER, *Scotland*, in the Year ended the 31st day of December 1892, in the Administration of ESTATES and TREASURE TROVE on behalf of the CROWN;"

"And, of ALPHABETICAL LIST of ESTATES which fell to the CROWN as ULTIMUS HÆRES in *Scotland*, administered by the QUEEN'S and LORD TREASURER'S REMEMBRANCER, in the Year ended the 31st day of December 1892."

Treasury Chambers, 4 July 1893.

JOHN T. HIBBERT.

(*Sir John Hibbert.*)

Ordered, by The House of Commons, *to be Printed*, 4 *July* 1893.

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ULTIMUS HÆRES ACCOUNT, 1892.

ABSTRACT ACCOUNT of Receipts and Payments of the Queen's and Lord Treasurer's Remembrancer in the Administration of Estates and Treasure Trove in *Scotland*, on behalf of the Crown, in the Year ended 31st December 1892.

	Estates' Account.	Crown's Share Account.	TOTAL.
	£. s. d.	£. s. d.	£. s. d.
Balances at beginning of Year - - -	30,048 18 2	12,376 9 11	42,425 8 1
Amount received in respect of Estates -	10,050 5 2	- -	10,050 5 2
Transfers from Estates' Account to Crown's Share Account (as *per contra*) - -	- -	774 12 6	774 12 6
Amount received in respect of Treasure Trove - - - - - - -	- -	1 8 –	1 8 –
£.	40,099 3 4	13,152 10 5	53,251 13 9

	Estates' Account.	Crown's Share Account.	TOTAL.
	£. s. d.	£. s. d.	£. s. d.
Amount paid in the Year for Debts and Expenses, &c., chargeable against Estates - - - - - - - -	2,476 7 6	- -	2,476 7 6
Amount paid on Account of Grants out of Estates - - - - - -	3,092 13 10	- -	3,092 13 10
Transfers from Estates' Account to Crown's Share Account - - - - -	774 12 6	- -	774 12 6
Fees paid to Vote for Treasury and Subordinate Departments - - - -	294 6 10	- -	294 6 10
Amount paid to Auditor - - - -	- -	25 – –	25 – –
Treasure Trove - - - - -	- -	12 2 2	12 2 2
Amount paid for a Deeds Box - -	- -	1 10 6	1 10 6
Balances at the close of the Year - -	33,461 2 8	13,113 17 9	46,575 – 5
£.	40,099 3 4	13,152 10 5	53,251 13 9

Note.—Real estate to the value of 708 *l.* was gifted on payment of Crown's Share and Costs; and a deposit note for 125*l.* was transferred to a Donee.

BALANCE SHEET, 31ST DECEMBER 1892.

	Liabilities.	Assets.
	£. s. d.	£. s. d.
Queen's and Lord Treasurer's Remembrancer - - - - -	- - -	46,575 – 5
Crown's Share Account - - - - - - - - -	13,113 17 9	—
Sundry Estates - - - - - - - - - - -	35,722 5 3	2,261 2 7
£.	48,836 3 –	48,836 3 –

Exchequer Chambers, Edinburgh,
26 June 1893.

Reginald Mac Leod,
Queen's and Lord Treasurer's Remembrancer.

Examined and found correct,
P. Woods, Auditor.

ALPHABETICAL LIST of ESTATES reported to the Queen's and Lord Treasurer's Remembrancer as having fallen to the CROWN as ULTIMUS HÆRES in *Scotland*, and dealt with by him, *virtute officii*, in the Year ended 31st December 1892.

Note.—By the Law of Scotland, the Queen's and Lord Treasurer's Remembrancer, by virtue of his office, is entitled to administer without confirmation (Letters of Administration) or other process of law the assets of estates which fall to the Crown as ultimus hæres in Scotland.

Name of Intestate.	Designation and Residence of Intestate.	REMARKS.
Anderson, James	Tailor, Dingleton, Melrose	Under administration.
Barnhill, Robert	Farm Labourer, Drumpellier	- ditto.
Brander, John	Farm Overseer, 68, Market Place, Inverurie.	Gift to mother of deceased.
Brown, Hugh	Gardener, Cauldshore, Girvan	Under administration.
Brown, Isabella	Domestic Servant, 24, Royal-terrace, Edinburgh.	Gift to mother and aunt of deceased.
Campbell, John	Engineer, Venezuela	Gift to adopted mother of deceased.
Campbell, Barbara Stewart	Ainslie Place, Edinburgh	Crown's claim abandoned.
Davidson, Margaret	Housekeeper, Allathan, New Deer	Under administration.
Dawson, Margaret	Late Domestic Servant, 15, St. Andrew-street, Aberdeen.	Gift to daughter.
Dickie, Isabella	Late Dressmaker, Prestwick, Ayr	Under administration.
Donaldson, Jane	Spinster, Cambusbarron	Next of kin found.
Dorward, Ann Todd, or	Domestic Servant, Montrose	Under administration.
Ewen, Ann Alexander	Housekeeper, Reinacharn, Tarland	- ditto.
Ferguson, Janet	Domestic Servant, St. Andrews	- ditto.
Fergusson, James	Joiner, Crossgates, Fifeshire	- ditto.
Fraser, Christina	Domestic Servant, Ellon	Debts exceeded assets.
Graham, Grace F. R.	Housekeeper, 71, Clerk-street, Edinburgh	Under administration.
Graham, Jane	Spinster, 6, Sandgate-street, Ayr	Next of kin found.
Grant, James	Tailor, Garmouth	Debts exceeded assets.
Heddle, Margaret Turnbull, or	Widow, the Strynd, Kirkwall	Under administration.
Henderson, Jane	Housekeeper, Bank House, Aboyne	- ditto.
Hunter, Ann	Spinster, Hopetoun House, Moffat	- ditto.
Jacque, Rev. George	South United Presbyterian Church, Auchterarder.	Next of kin found.
Kettle or Kettles, Alexander	Farm Servant, 12, Dovecotland, Perth	Gift to paternal aunt of deceased.
Leadbetter, Agnes	Servant, Carter Law Cottage, The Hirsel, Coldstream.	Under administration.
Lester, John	Showman, Carlisle	Debts exceeded assets.
Mathers, Margaret	Cottager, New Byth	- ditto.
Millar, Jane	Cook, 7, Napier-road, Edinburgh	Under administration.
Morison, Charles	Farmer, Gariochsburn, Forgue	- ditto.
McAnelly, John	Bleacher, Craigton, Milngavie	- ditto.
McCafferty, Catherine McLelland, or McGavin, Ellen	Widow, 400, South Cumberland-street, Glasgow. Cairnfarm, Cumnock	- ditto. Gift to trustees on behalf of son of deceased.

ALPHABETICAL LIST of Estates reported to the Queen's and Lord Treasurer's Remembrancer, &c. - *continued.*

Name of Intestate.	Designation and Residence of Intestate.	REMARKS.
McKenzie, John Leslie - -	Baker, Fife-Keith - - - - -	Under administration.
McLean, Donald - - -	Spirit Salesman, Fort William - -	- ditto.
McQuhir, Alexander - -	Millwright, Crae Cottage, Balmaghie -	Gift to daughter of deceased.
Nicol, William - - -	Farm Servant, Chatto - - - -	Gift to mother.
Niven, Andrew - - -	Commission Agent, 140, Victoria-road, Glasgow.	Debts exceeded assets.
Radcliffe, Mary Ann - -	Spinster, Portobello - - - -	Estate sequestrated.
Reid, Mary - - - -	Spinster, Dumfries - - - - -	Under administration.
Robson, Thomas - - -	Carrier, Maisondieu, Jedburgh - -	- ditto.
Roy, Amelia - - - -	Spinster, Chrichton Institution, Dumfries -	Gift to sister.
Sandilands, Eliza - - -	Millworker, Penicuik - - - - -	Mother confirmed to estate.
Seaton, Eliza - - - -	Nurse, Abbey Hotel, Melrose - - -	Gift to niece.
Simpson, George - - -	Boiler Maker, Inverness - - -	Under administration.
Smith, James - - - -	Farm Servant, West Clashfarquhar, Portlethen, and 50, North Charlotte-street, Aberdeen.	- ditto.
Steele, Janet - - - -	Spinster, England, Pitcaple, Garioch -	Crown's rights not determined.
Stewart, Margaret - - -	Domestic Servant, Knockbog, Grange -	Gift to daughter of deceased.
Thiele, Captain August Hermann.	Master Mariner - - - - -	Under administration.
Thomson, Andrew - - -	Grocer, 291, Argyle-street, Glasgow -	- ditto.
Thomson, Jane Sime - -	Pensioner, 2, Bruce-street, Morningside, Edinburgh.	- ditto.
Thomson, John - - -	Horsedealer, Glasgow - - - -	Crown found to have no interest.
Wallace, Jane - - - -	Pauper, Maryhill, Monquhitter - -	Estate surrendered to Poor Law authorities.
Weir, Isabella - - - -	Nurse, 7, Grosvenor-place, Edinburgh -	Gift, one-third to mother; two-thirds to sister.
White, Sarah - - - -	Spinster, Straiton, Maybole - - -	Under administration.
Wildgoose, William - -	Farm Servant, Mains of Annochie, Old Deer.	Gift, two-thirds to brothers and sisters consanisguean; one-third to sistes uterine.
Whitten, Margaret - - -	Edinburgh - - - - - - -	Next of kin found.
Wilson, Ann - - - -	Housekeeper, St. Fink, Blairgowrie -	Gift to mother.
Wilson, Janet Glasgow, or	Widow, Douglas, Lanarkshire - - -	Under administration.
Wilson, William - - -	Retired Cashier, 425, Sauchiehall-street, Glasgow.	Crown's right not determined.
Young, Christina - - -	Spinster, 49, Holmhead-street, Glasgow -	Under administration.
Yule, James Steel Hardy -	Juniper Green - - - - - -	No assets.

Exchequer Chambers, Edinburgh, 24 May 1893.

Reginald MacLeod,
Queen's and Lord Treasurer's Remembrancer.

ULTIMUS HÆRES (SCOTLAND) (ACCOUNT AND LIST OF ESTATES).

COPY of RETURNS of ABSTRACT ACCOUNT of the RECEIPTS and PAYMENTS of the QUEEN'S and LORD TREASURER'S REMEMBRANCER, *Scotland*, in the Year ended 31 December 1892, in the Administration of ESTATES and TREASURE TROVE on behalf of the CROWN; And, of ALPHABETICAL LIST of ESTATES which fell to the CROWN as ULTIMUS HÆRES in *Scotland*, administered by the QUEEN'S and LORD TREASURER'S REMEMBRANCER, in the Year ended 31 December 1892.

(*Sir John Hibbert.*)

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